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Attachment 1

AMBIONICS, INCORPORATED

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STATE GOVERNMENT ACTIVITIES IN REMOTE SENSING

William Bailey
William Bailey
Research Director

Elliott DeGraff
Elliott DeGraff
President

(NASA-CR-147927) SURVEY AND ANALYSIS OF N76-23664
POTENTIAL USERS OF REMOTE SENSING DATA
Final Report (Ambionics, Inc., Washington,
D.C.) 222 p HC \$7.75 CSCL 05B Unclassified
G3/43 15141

Prepared under Contract NASW-2756

November 12, 1975

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Alabama

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

AL Geological Survey

Based upon ERTS-I Exp. #271: Preliminary land use map of areas of this state produced from ERTS imagery. Water quality parameter study in Warrior River and Mobile Bay using DCP's & ERTS imagery.

1, 2

AL Development Office

ERISTAR (Earth Resources Information Storage, Transfer, and Retrieval): Based upon University Affairs Engineering Design Program summer project (by university researchers on site at MSFC) for 1972. Completed and published a preliminary design for a state & regional oriented earth resources data & information system. As a result, the governor created a Governor's Committee for Remote Sensing Applications with representation of key state agencies and MSFC.

2, 3

AL Development Office

Governor's Committee for Remote Sensing

AL Geological Survey

Strip Mine Impact Studies: Aircraft & ERTS imagery are being studied to determine land & water pollution impacts from strip mining in northwest Alabama.

4, 5

AL Marine Sciences Consortium

Mobile Bay Water Quality Studies: Aircraft & satellite imagery & DCP comparison studies are determining possible applications of remote sensing to detecting water quality conditions & changes.

6

AL Forestry Commission

Pine Bark Beetle Investigations: Using aircraft & ERTS imagery, pine beetle infestations were detected & mapped in selected forest areas. Studies continue to determine if spread can be predicted. An inexpensive map of the whole state showing all forested areas has been prepared and is being used by the Forestry Commission.

7, 8

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Alabama continued:

AL Agriculture Extension Service

Crop Stress Study: Aircraft & ERTS multispectral imagery 7 is being studied to determine crop stress prediction possibilities in cotton & peanuts. Tomato nematode infestations have been clearly delineated.

AL Dept. of Conservation
AL Geological Survey

Birmingham New Community Site: Sponsoring agency (Tuskegee Alumni Housing Foundation) dropped plans for developing new town site following survey using ERTS and A/C imagery. Owners developed a new coal seam based on findings. 4, 9

Top of Alabama Council of
Governments (TARCOG)

Land Use Survey: Completed a land use map of the TARCOG 10, 11 five county area in North Alabama using ERTS & A/C multispectral imagery. A TVA sample map was produced.

AL Geological Survey
AL Development Office

Shoreline measurements: Shoreline lengths are used in 12, 2 regional planning and affect the allotment of funds. Alabama (and other states) have disputed USACE measurements. Present methods of measuring reflect operator bias and other inconsistencies. Shorelines are also constantly changing. Accurate, objective and repetitive measurements are needed. Daniel Sapp is advocating the use of a computer system which could examine satellite imagery pixel by pixel and provide direct conversion from imagery to computer eliminating the map stage.

CONTACTS:

1. Harold Henry, Alabama Geological Survey, Univ. of Alabama, Tuscaloosa, AL 35486, (205) 532-9155.
2. R. C. "Red" Bamberg, Director, Alabama Development Office, State Office Building, Montgomery, AL 36104, (205) 269-1831.
3. Cecil Messer, MSFC.
4. John Bensko, MSFC.
5. Philip E. LaMoreaux, State Geologist, AL Geological Survey, University, AL 35486, (205) 759-5721.
6. Rex R. Morton, MSFC.
7. Sanford Downs, MSFC.

(continued)

Alabama continued:

8. Cecil W. Moody, Forester, AL Forestry Commission, Montgomery, AL 36104, (205) 269-6634.
9. Claude D. Kelly, Commissioner, Dept. of Conservation & Natural Resources, Montgomery, AL 36104, (205) 269-6011.
10. C. T. Paludan, MSFC.
11. Dean Matthews, Executive Director, TARCOG, Suite 350, State National Bank Building, Huntsville, AL 35801, (205) 533-3330.
12. C. Daniel Sapp, Geological Survey of Alabama, P.O. Drawer O, University, AL 35486.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Alaska

COOPERATING ORGANIZATIONS

Geophysical Institute
 Department of Highways
 Department of Fish and Game
 Department of Natural Resources/Geological Survey
 Department of Economic Development/Industrial Development
 Department of Public Works/
 Division of Aviation
 Department of Environmental Conservation
 Department of Governor/
 Planning & Research

PROGRAM/STATUS/RESULTS

User Assistance Program - Geophysical Institute - provides strong support to both the governmental and private sectors of the user community with its library and interpretive facilities. Probably no state is making more use of remote sensing and ERTS products than Alaska and the Geophysical Institute plays a strong lead role in these remote sensing activities.

CONTACTS

1, 2

ERTS-1 follow-on investigations by the Geophysical Institute:

- 1 - Tectonic Structure-Seismic Activity
- 2 - Wildlife Habitat Mapping
- 3 - Ice Surveys Along Arctic Coast

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There were 12 original ERTS-1 investigations which were coordinated by Belon who was also a PI. Many of their findings were applicable to operational systems. The follow-on experiments are also being supported by the state and results will be used by state agencies.

CONTACTS:

1. John H. Miller, Head of Scientific Services, Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701, (907) 479-7291.
2. Robert W. Pavitt, Director, Division of Planning & Research, Office of the Governor, Pouch AD, Juneau, Alaska.
3. Albert Belon, ERTS Project Coordinator, Geophysical Institute, University of Alaska, Fairbanks, Alaska, (907) 479-7565.

ALASKA continued:

4. Larry D. Gedney, University of Alaska, Fairbanks, Alaska.
5. Peter C. Lent, University of Alaska, Fairbanks, Alaska.
6. William J. Stringer, University of Alaska, Fairbanks, Alaska.

NOTE: Although the role of the state agencies will increase when revenue from the North Shore oil starts coming in, the Federal agencies will play a major role in developing any operational remote sensing program in Alaska. The Federal government is by far the states' largest landholder and has long been responsible for demonstrating the value of an operational remote sensing program. A real and felt need for remote sensing products, over 50% image overlap on succeeding passes, a developing state infra-structure that is not tied to old ways of doing things, and the Federal government is going to have to pay for most of the operational activities anyway. A demonstration project supported by a consortium of Federal agencies would appear to make a lot of sense.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Arizona

PROGRAM/STATUS/RESULTS

DCS platforms were used to provide operational data to control water flow during flood stages of Salt River in March 1973. DCS System proved more reliable and useful than microwave system now in use.

CONTACTS

1, 2

Arizona is developing a central data bank for remote sensing products. It does not have a dedicated computer but uses the Highway Department's facilities. ERTS, Skylab, and U-2 imagery of the whole state is now available to all state agencies.

3

Arizona Land Use Experiment: ARIS is developing operational techniques to combine the capability of ERTS and other image sources - capitalizing on ERTS ability to monitor change and the greater resolution of imagery from other sources. An ARIS ERTS-B proposal was not funded by NASA.

3, 4

Presently mapping potential sources of geothermal energy.

Using ERTS mosaic to map land developments and subdivisions.

3, 5

Using U-2 imagery now in inventorying.

2, 3, 6

COOPERATING ORGANIZATIONS

State Department of Water Resources
USGS
Watershed Division, Salt River Project

Arizona Resources Information System
State Highway Department

Arizona Resources Information System

Arizona Oil and Gas Conservation Commission
Arizona Land Department
Arizona Resources Information System
USGS

Arizona Office of Economic Planning and Development
Arizona Resources Information System
USGS

Arizona Department of Agriculture, Statistical Reporting Service
Arizona Resources Information System
USDI

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ARIZONA continued:

Arizona Resources Information System
Arizona Department of Agriculture
Bureau of Land Management

BLM ERTS Follow-on: Monitoring range and grazing practices. Experiment will be followed by Winikka and made available to Agriculture and other interested State agencies.

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Office of Arid Lands Studies
University of Arizona
Cochise County Planning Department
Pima County Planning Department
Planning Division, City of Tucson
Mohave County Planning Department

Technology Transfer to local and regional agencies - an ERTS-1 follow-on. The Office of Arid Lands Studies works with many local and regional (not State) agencies developing remote sensing expertise in these agencies. Flood plain and thematic mapping for planning agencies, environmental monitoring and hydrological studies have been carried out in cooperation with these agencies.

8

CONTACTS:

1. William Warskow, Lead Watershed Specialist, Watershed Division, Salt River Project, P.O. Box 1980, Phoenix, Arizona 85001, (602) 273-5680.
2. Herb Schumann, USGS, Phoenix, Arizona, 8 (602) 261-3188.
3. Carl Winikka, Arizona Resources Information System, State of Arizona, Phoenix, Arizona, 8 (602) 271-4061.
4. Andrew L. Bettwy, Land Commissioner, Capitol Annex East, Phoenix, Arizona 85007.
5. Robert G. Worden, Executive Director, Office of Economic Planning and Development, Phoenix, Arizona 85007
6. H. M. Mayes, Statistician, Statistical Reporting Service, Arizona Department of Agriculture, Phoenix, Arizona 85007.
7. G. Russell Bentley, Bureau of Land Management, Denver, Colorado.
8. Larry K. Lepley, University of Arizona, Tucson, Arizona, (602) 884-1955.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Arkansas

<u>COOPERATING ORGANIZATIONS</u>	<u>PROGRAM/STATUS/RESULTS</u>	<u>CONTACTS</u>
University of Arkansas State Geological Survey	ERTS Follow-on Experiment: Land use change detection and water quality monitoring. Results to be made available to all state agencies.	1, 2
University of Arkansas State Highway Department	ERTS imagery has been used in highway planning primarily to avoid landslide prone areas.	1, 3
Ozark Regional Commission	Arkansas is a member of this Commission that has used ERTS imagery in regional planning activities. Commission is a planning body. Operational activities are carried on by state agencies.	4, 1

CONTACTS:

1. Harold C. MacDonald, University of Arkansas, Fayetteville, Arkansas 72701, (501) 575-3355.
2. True Holbrook, Acting Director, State Geological Commission, Little Rock, Arkansas 72201.
3. Henry Gray, Director, Highway Department, Little Rock, Arkansas 72201.
4. Bobby McCullough, Ozark Regional Commission, 125 Mart Building, Little Rock, Arkansas 72202.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: California

COOPERATING ORGANIZATIONS**PROGRAM/STATUS/RESULTS****CONTACTS**

Office of Science and
Technology
All State Agencies
Ames Research Center

The Office of Science and Technology is responsible for coordinating all remote sensing activities in California and applying results to resource management. Multi-agency multi-part ERTS-B proposal was not accepted but Davis is P.I. in ERTS follow-on experiments accepted.

1

Office of Science and
Technology
Department of Water Resources
Ames Research Center
State Water Resources Control
Board

ERTS Follow-on Experiment: Plan to develop a new water monitoring system based on the most efficient use of standard and satellite remote sensing techniques.

1, 2, 3

Office of Science and
Technology
California Dept. of
Transportation
U.S. Dept. of Parks and
Recreation
Jet Propulsion Laboratory

ERTS-B proposal to use ERTS data in highway and recreation was not accepted but California DOT is still working on project. Want to modify existing data bases and information systems to take advantage of ERTS ability to monitor change.

4,

Office of Science and
Technology
Ames Research Center

Ames Research Center is working with State authorities on handling disaster assessments, i.e., floods, fires, etc.

5

Office of Science and
Technology
State Dept. of Agriculture
Ames Research Center

Crop Stress Detection: Most work done with U-2 imagery on asparagus and fruit crops. Ames Research Center considers results impressive.

6

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CALIFORNIA continued:

Office of Science and
Technology
Army Corps of Engineers

Corps of Engineers are carrying on an ERTS coast near-shore process study in California waters. The Office of Science and Technology is interested in applying results to state problems.

1

Office of Science and
Technology
NOAA

Donald Wiesnet (NOAA) is P.I. of an ERTS-1 follow-on investigation in California and the Office of Science and Technology would like to apply results to California problems.

1

Office of Science and
Technology
State Dept. of Food and
Agriculture
Water Resources Control Board
University of California

A statewide inventory of California's irrigated lands is being made using ERTS and A/C data. Robert Colwell is P.I. of ERTS follow-on investigation but his results will be utilized by the State agencies.

7, 1, 8

CONTACTS:

1. A. Earl Davis, Director, Office of Science and Technology & Remote Sensing Coordinator, Governor's Office, Resources Building, 1416 9th Street, Sacramento, California 95814, 8-(916) 445-4422.
2. Alan J. Stratton, Ames Research Center, (415) 965-5898.
3. Gilbert W. Fraga, Office of Science and Technology, Governor's Office, Resources Building, 1416 9th Street, Sacramento, California 95814, 8-(916) 445-4422.
4. William E. Schaefer, Department of Transportation, 2520 Marconi Avenue, Sacramento, California 95821, (916) 445-7111.
5. Jerry M. Deerwester, Ames Research Center, (415) 965-5897.
6. David Adams, State Department of Agriculture, Sacramento, California, 8-(916) 445-8314.
7. Robert N. Colwell, Space Science Laboratory, University of California, Berkeley, California, (415) 642-5170.
8. C. B. Christensen, Director, Department of Food and Agriculture, Sacramento, California 95814.

NOTE: There were 21 ERTS-1 and 13 EREP investigations as well as 4 additional follow-on investigations in California. State authorities have cooperated with many of the investigators and extensive use has been made of the products of these investigations. California wants an operational ERTS-type system. In addition, satellite imagery has been used extensively by California A & E firms in plant siting and environmental impact studies.

<u>COOPERATING ORGANIZATIONS</u>	<u>PROGRAM/STATUS/RESULTS</u>	<u>CONTACTS</u>
Colorado Geological Survey, Dept. of Natural Resources Institute of Arctic & Alpine Research, Univ. of Colorado Boulder Area Growth Study Commission	The Institute of Arctic and Alpine Research (INSTAAR) together with the Colorado Geological Survey is conducting an ERTS follow-on experiment to "Delimit avalanche and landslide hazards in Colorado. INSTAAR has also been with the state legislature and county authorities on land use legislation and accompanying monitoring and enforcement problems. Land use speculation and development in potentially dangerous areas is a serious problem in Colorado. State and county authorities expect to apply the results of INSTAAR's investigation to their land use planning. The results of an earlier ERTS investigation (Richard F. Madole, P.I.) have been used by both state authorities and Boulder County planners.	1, 2
Board of Agriculture Colorado Dept. of Natural Resources Institute of Arctic & Alpine Research U.S. Forestry Service	ERTS Follow-on Forestry Experiment, Paula Krebs, P.I. State agency personnel are providing ground truth and expect to apply results of investigation to own work.	3
Federation of Rocky Mountain States Colorado State University Concerned State Agencies	ERTS Follow-on: A continuous regional land use survey in which agencies of the member states will participate actively. Agency personnel hope to get experience in a quasi-operational system. Colorado State University will do the imagery analysis.	4, 5, 6
State Department of Agriculture Colorado State University	ERTS-B proposal by Department of Agriculture and Colorado State University was not accepted but Departments Experiment Stations are carrying out limited studies on the application of remote sensing to the monitoring and prediction of crops in Colorado.	7, 4

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COLORADO (continued)

State Department of Natural Resources
Colorado State Land Commission
State Dept. of Agriculture
Dept. of Local Affairs, Property Tax Division
Highway Department
Colorado State University

A state-wide ERTS-B proposal by Colorado State University and these agencies was not accepted. Senior agency people who were involved are either leaving or have left government. However Colorado State University is still working with these agencies on remote sensing projects and are hopeful that the new administration under Governor Lamb will provide state support for some of these programs.

8, 4

CONTACTS:

1. Jack Ives, Director, INSTAAR, Univ. of Colorado, Boulder, Colorado 80302, (303) 892-2778.
2. John Rold, Director, Colorado Geological Survey, Department of Natural Resources, 1845 Sherman Street, Denver, Colorado, (303) 492-6387.
3. Paula V. Krebs, INSTAAR, (303) 492-8841.
4. Eugene Maxwell, Colorado State University, Fort Collins, Colorado 80521, (303) 491-5147.
5. George Nez, Federation of Rocky Mountain States, Inc., 2480 West 26th Street, Denver, Colorado 80211, (303) 458-8000.
6. Lou Campbell, Division of Planning, Department of Local Affairs, Denver, Colorado 80203, (303) 892-2178.
7. C. Jeffers, Commissioner, Department of Agriculture, State Services Building, Denver, Colorado (303) 992-2811.
8. Tom Ten Eyck, Director, Department of Natural Resources, State Capitol, Denver, Colorado 06115, (303) 892-9911.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Connecticut

<u>COOPERATING ORGANIZATIONS</u>	<u>PROGRAM/STATUS/RESULTS</u>	<u>CONTACTS</u>
(No direct State participation - using maps and ERTS derived data developed by others. Corps of Engineers reservoir management study - which clearly demonstrated the usefulness of an operational DCS system - could be of great importance to the state. Ongoing USGS study on sediment plumes in Long Island Sound should also be of interest to State authorities.)		
	ERTS-1 investigation in Connecticut: Studying sediment plumes in Long Island Sound.	1
	Reservoir Management (DCS Study): Feasibility demonstrated - positive interest in operational system.	2
	ERTS Map of Connecticut: Map prepared at Dartmouth - used by State authorities.	3
	ERTS Follow-on: Use of ERTS and Data Collection System imagery in reservoir management and operation.	2

CONTACTS:

1. Fred H. Ruggles, USGS, Hartford, Connecticut.
2. Saul Cooper, U.S. Army Corps of Engineers, Waltham, Massachusetts
3. Robert B. Simpson, Department of Geography, Dartmouth College, Hanover, New Hampshire 03755, (603) 646-1110.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Delaware

COOPERATING ORGANIZATIONS

Dept. of Natural Resources and
Environmental Control
University of Delaware

Dept. of Natural Resources and
Environmental Control
State Planning Office
University of Delaware

Dept. of Natural Resources and
Environmental Control
University of Delaware

PROGRAM/STATUS/RESULTS

ERTS and NASA A/C imagery are being used to develop a marsh relative value model for planning wetlands development. Thematic maps on the scale of 1:24,000 were produced directly from ERTS imagery and A/C are now being used to develop detail where needed.

Using remote sensing to:

1. Verify and extend sediment transport model of Delaware Bay and monitor water quality.
2. Extend and verify predictive model for oil slick movements.
3. Modify a hydrodynamic model of Delaware Bay. (Foam lines along convergent boundaries with toxic substances can be detected.) Accurate and timely pollution data is needed to protect the oyster beds of Delaware.
4. Monitor sludge and acid dumping in coastal waters.
5. Beach erosion along the coast.

The University of Delaware is waiting for a decision on a proposal to monitor land use changes along the coast over an extended period (10 yrs.). The development of offshore oil resources is imminent and the state wants to monitor its impact. A start has already been financed by other sources but this study will probably be supported by the State and the NOAA-Seagrant program.

CONTACTS

1, 2

1, 2, 3, 4

1, 5

CONTACTS:

1. N. C. Vasuki, Director, Division of Environmental Control, Dept. of Natural Resources and Environmental Control.
2. V. Klemas, College of Marine Studies, (302) 738-2842.
3. David Hugg, Bureau of Land Management, Dept. of Natural Resources & Environmental Control, (302) 678-4271.
4. Robert Henry, Div. of Soil and Water Conservation, Dept. of Natural Resources & Environmental Control, (302) 678-4411.
5. Robert Henry, Director, Div. of Soil & Water Conservation, Dept. of Natural Resources & Environmental Control, (302) 678-4411.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Florida

COOPERATING ORGANIZATIONS

Brevard County Development Administration

Florida Dept. of Natural Resources
Kennedy Space Center

Florida State Entomological Center
Kennedy Space Center

Florida Game & Fresh Water Fish Commission
Kennedy Space Center

PROGRAM/STATUS/RESULTS

The Brevard County Development Administration has served as a lead agency in applying remote sensing to regional planning in east central Florida. Land-use maps of Brevard County have been prepared and are in use and they are now assisting Orange County. They are also digitizing data for use in other jurisdictions.

Glenn Vause has been assigned full time to KSC to help develop a statewide system for detecting, identifying, and monitoring the growth of aquatic weeds which can seriously affect the ecology of Florida.

The Florida State Entomological Center is presently evaluating the results of a mosquito control study. Mosquito larvae can be destroyed by flooding but if not carefully watched the mangrove stands in the breeding areas can also be destroyed. The Entomological Center and KSC are attempting to determine if the onset of moisture stress can be detected through remote sensing. If flooding period can be properly timed this technique could have important economic and environmental consequences.

The Commission is attempting to develop a mathematical model of the hydrological system associated with the St. Johns River. They are attempting, with some success, to relate water changes to plant community changes. If successful, model will be used in managing the State's water resources.

CONTACTS

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Florida (continued)

Florida Dept. of Agriculture
Institute of Food & Agricultural
Sciences
Florida Citrus Mutual
Kennedy Space Center
NOAA

The Institute of Food and Agricultural Sciences is attempting to verify, modify, and exploit a freeze prediction model developed by James George of NOAA. Presently they are using thermal IF and A/C and Dept. of Defense and NOAA satellites. Potential benefits are tremendous and they are getting strong support from the citrus growers in Florida. Early results were extremely encouraging but study is dependent on freezing conditions occurring in Florida - obviously a slow process. At this time however, with present technology, they see no reason why it would not be possible to predict freezing conditions on standard TV weather programs. Maps would show areas where precautionary methods should be taken.

6, 7, 8, 9

Florida Dept. of Agriculture
Kennedy Space Center

Kennedy Space Center is studying the feasibility of using remote sensing to detect and monitor the spread of Citrus Young Growth Decline.

10

Florida Fish & Wildlife Office
USGS
Corps of Engineers
U.S. Forest Service

A DCP network (20 platforms) and ERTS imagery are being used to monitor and make environmental assessments and manage the water resources of 3600 sq. kilometers in the Everglades. Proved particularly useful during the 1973-74 winter spring draught where damage was minimized by planning based upon accurate knowledge of the water stored in the various lakes, canals, and conservation areas. Soil moisture sensors on the DCP's are also being used to warn of potential fire hazards.

4, 5

Florida (continued)

Florida Dept. of Transportation

The Florida Dept. of Transportation is a depository for A/C and ERTS imagery. The Dept. has used ERTS imagery in mapping the April 1972 Suwanee River Flood and for mapping geological formations. The Dept's. Remote Sensing Group is primarily interested in finding new cost-effective mapping techniques - particularly with reference to highway construction - and is not particularly excited by the possibilities raised by ERTS. It also assists other State agencies in their remote sensing activities.

11

CONTACTS:

1. Garland Thomas, (305) 267-9411.
2. Glenn Vause, Bureau of Aquatic Weed Research and Control, Dept. of Natural Resources, KSC, (305) 867-3017.
3. T. Hammond, KSC, (305) 867-3017.
4. David Cox, (305) 724-1571.
5. Edward Vosatka, Florida Game and Fresh Water Fish Commission, 7630 Coral Drive, West Melbourne, Florida 32901.
6. Paul Toft, KSC, (305) 867-7705.
7. Jon Bartholic, Institute of Food and Agricultural Sciences, Gainesville, Florida 32611, (914) 392-1996.
8. Dr. James Griffiths, Spec. Prod., Florida Citrus Mutual, Box 89.
9. Thomas Osborne, General Manager, Florida Citrus Mutual, Box 89.
10. Thomas Davis, KSC, (305) 867-3017.
11. T. E. Grieppentrog, Florida Dept. of Transportation, Tallahassee, Florida 32304, 488-2168.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Georgia

COOPERATING ORGANIZATIONS

Office of the Governor

Georgia Department of Natural Resources

Georgia Department of Natural Resources

Georgia Department of Transportation

Georgia Department of Natural Resources

PROGRAM/STATUS/RESULTS

Planning and Surveying Coastal Areas and Wetlands:
Governor Carter met with governors of North & South Carolina on 12-17-73 to discuss plans for cooperative activity.

Determine Better Method of Preparing Comprehensive Geological Maps: Active.

Geonatural Resource Remote Sensing: Active.

ERTS Applications: Being initiated.

State Farm Pond Survey: Completed, saved 50-80% of \$4M Budget.

CONTACTS

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CONTACTS:

1. Office of the Governor, State Capitol, Atlanta, Georgia 30334
2. U. R. Barnett, KSC, (305) 867-3017
3. T. Davis, KSC, (305) 867-3017
4. G. Wm. Spann, Director, Remote Sensing, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia 30332, (404) 894-3589
5. Joe Tanner, Commissioner, Department of Natural Resources, 270 Washington Street, S.W., Atlanta, Georgia 30334, (404) 656-3500

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Hawaii

COOPERATING ORGANIZATIONS

Dept. of Planning and Economic Development

PROGRAM/STATUS/RESULTS

Apparently no active remote sensing activities. High interest but some skepticism because of past grandiose promises by others have not come about, e.g. they feel that NASA officials promised solutions to many of their state long range land-use planning problems would be solved by space imagery. They have not seen nor see indications of this coming about. In sum they are waiting to be shown that remote sensing is worthwhile. Very progressive state as seen by other federal agencies because of their pioneering legislation in many areas such as statewide land use planning laws.

CONTACTS

1

CONTACTS:

1. Hideto Kono, Director, Dept. of Planning and Economic Development, 250 S. King St., Honolulu, Hawaii 96813, (808) 548-6914.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Idaho

COOPERATING ORGANIZATIONS

State Planning and Community Affairs Agency
Pacific Northwest Regional Commission
Ames Research Center

PROGRAM/STATUS/RESULTS

Land Resources Inventory Demonstration Project: The Planning and Community Affairs Agency represents Idaho in this project which is being coordinated by the Pacific Northwest Regional Commission. Wally Hedrick is Project Director in Idaho. Purpose of project is to build remote sensing capability in the State agencies. Representatives from the various State agencies are being sent to Ames Research Center to learn how to use LANDSAT type data. A consortium of universities (Univ. of Oregon is Prime Contractor) is providing support. (E. W. Tisdale - an ERTS-1 investigator is also associated with this project.) In first phase, thematic maps (soils, vegetation, ownership, energy and land-use) will be prepared. Mr. Hedrick hopes to prove the cost-effectiveness of this approach. Success will likely lead to a Statewide Planning Information Service.

CONTACTS

1, 2, 3,
4,

CONTACTS:

1. Wally Hedrick, Planner for Information Systems, State Planning & Community Affairs Agency, State of Idaho, Boise, Idaho, 8-(208) 964-3275 or 384-3416.
2. William Bruner, Research Director, Pacific Northwest Regional Commission.
3. Patrick Vaughn, Special Assistant to the Governor, Governor's Office, Boise, Idaho, (208) 384-2100.
4. Michael Donely, University of Oregon, (503) 686-4555.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Illinois

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

No evidence of direct state participation in remote sensing activity for Illinois, but several investigations in Illinois have taken place, such as crop identification/LARS; environmental consideration in dam construction/USACE, urban and regional change monitoring/USGS, air quality study/Mitre Corporation; corn blight watch experiment.

COOPERATING ORGANIZATIONS

LARS/Purdue
Division of Planning,
Indiana Dept. of Commerce
NASA
EPA

Indiana Geological Survey
LARS/Purdue

Indiana Heartland Coordinating
Commission
LARS

Commission on Environmental
Quality
LARS

Division of Reclamation,
Dept. of Natural Resources
LARS

Indiana Dept. of Natural
Resources
Indiana Geological Survey

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Indiana

PROGRAM/STATUS/RESULTS

NASA/Office of University Affairs and EPA are supporting a LARS study, "Applications of Remote Sensing to the Solution of Problems in the Management of Resources in Indiana". An 85,000,000 acre land-use inventory will be prepared but primary goal will be to assist the Planning and other State agencies develop cost-effective ways of utilizing new remote sensing techniques.

Satellite imagery has been used to locate gravel deposits and pinnacle reefs (small dome-shaped subsurface features where limestone is likely to be found) for use in highway construction. First three sites selected produced gravel as predicted.

The Indiana Heartland Coordinating Commission, an eight county regional planning group set up by the state legislature, is using computer processed ERTS data and land-use maps produced by LARS. Six of eight counties have now been mapped.

Power Plant Siting: ERTS and thermal imagery have been used to evaluate power plant sites for the Commission.

LARS is seeking to develop a system for monitoring strip mining activities and reclamation efforts. The Division of Reclamation is supporting and cooperating in this project by providing ground truth.

Geological Study - Mine Hazards: ERTS imagery used to locate potentially hazardous mines.

CONTACTS

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Indiana (continued)

CONTACTS:

1. Richard Gilbert, LARS/Purdue, West Lafayette, Indiana, (317) 749-2052.
2. Michael Moore, Indiana Geological Survey, 611 W. Walnut Grove Avenue, Bloomington, Indiana 47401.
3. Richard McNabb, Division of Reclamation, Dept. of Natural Resources, 613 State Office Bldg., Indianapolis, Indiana 46204.
4. Charles Weir, Dept. of Natural Resources, Indiana Geological Survey, 611 W. Walnut Grove Avenue, Bloomington, Indiana 47401.
5. Theodore Pantazis, Director, Division of Planning, Dept. of Commerce, Indianapolis, Indiana 46204.
6. Neil Horstman, Indiana Heartland Coordinating Commission, 7202 N. Shadeland, Indianapolis, Indiana 46250, (317) 849-4628.

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COOPERATING ORGANIZATIONS

Iowa Geological Survey
Remote Sensing Laboratory
All State Agencies

Iowa Map Advisory Council

Iowa Geological Survey
Remote Sensing Laboratory
USGS

Iowa Geological Survey
Remote Sensing Laboratory
Department of Geology
University of Iowa

Iowa Agriculture Experiment
Station
Iowa State University

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Iowa

PROGRAM/STATUS/RESULTS

Iowa is developing a coordinated remote sensing program which relies heavily on the applications oriented knowledge of state user agency personnel. User agency personnel are used in the research, design and interpretation phases of remote sensing investigations. The Iowa Geological Survey Remote Sensing Laboratory is serving as a clearinghouse for all remote sensing activities and is helping to develop remote sensing specialists within the user agencies. Iowa wishes to avoid the development of a large stand-by highly specialized multidisciplinary remote sensing staff within any one agency by developing expertise within the user agencies themselves.

"A Guide to Aerial Imagery of Iowa": Compiled and published an index of Iowa imagery so the problem of redundant data acquisition could be analyzed and corrective measures taken. Index is arranged around 15 planning regions in Iowa and includes imagery obtained by both governmental agencies and private industry.

Further the Application of Remotely Sensed Data from ERTS: Under a grant from the EROS Program of the USGS an atlas of land and water planning maps was developed.

Utilized ERTS-1 Imagery for Tectonic Analysis of the Big Horn Mountains Region: Mineral resources, geological structure and landform surveys -- geomorphic and landform surveys.

Remote Sensing in Iowa Agriculture: Agriculture/Forestry /Range Resources -- crop survey and classification.

CONTACTS

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IOWA continued:

Iowa Geological Survey
Remote Sensing Laboratory
Jet Propulsion Laboratory

ERTS Follow-on: "Land Classifications of South-Central Iowa from Computer Enhanced Images." Maps of land classifications (1:125,000 scale) have been produced. Will now apply existing automated data processing techniques to digital tapes. Long-term objective is to increase understanding of the applications of existing automated data processing techniques to the analysis of remotely sensed data from satellites. Thematic maps produced will be used by state and regional planners.

2, 6

Iowa Natural Resources Council
U.S. Environmental Protection Agency

Iowa Natural Resources Council is working closely with the Federal EPA on low altitude and satellite documentation missions.

7

Iowa Office of Planning and Programming
Iowa Geological Survey
Remote Sensing Laboratory
University of Iowa

Iowa is developing a pilot land information system that will accommodate point, line and polygon types of data.

1, 8

CONTACTS:

1. Samuel J. Tuthill, State Geologist, Iowa Geological Survey, 16 West Jefferson Street, Iowa City, Iowa 52240, (319) 338-1173.
2. James V. Taranik, Chief of Remote Sensing, Iowa Geological Survey, 16 West Jefferson Street, Iowa City, Iowa 52240, (319) 338-1173.
3. Richard Riley, Chairman, Air Photo Subcommittee, Iowa Power and Light Company.
4. Richard A. Hoppin, Department of Geology, University of Iowa, Iowa City, Iowa.
5. John P. Mahlstedt, Iowa Agriculture Experiment Station, Iowa State University, Ames, Iowa.
6. Frederic C. Billingsley, Supervisor of the Science Data Development Group, Jet Propulsion Laboratory, California Institute of Technology.
7. Othie R. McMurry, Director, Natural Resources Council, Des Moines, Iowa 50319.
8. Robert F. Tyson, Director, Office for Planning and Programming, Des Moines, Iowa 50319.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Kansas

COOPERATING ORGANIZATIONS

All State Agencies
Remote Sensing Laboratory,
University of Kansas Space
Technology Center

PROGRAM/STATUS/RESULTS

Governor's Conferences: Former Governor Docking held two Governor's Conferences on remote sensing for directors and key personnel of Kansas state agencies and those in adjoining states. This had a strong impact on the KERS program, see below. A direct saving of \$20,000,000 was made when an attendee from Kansas served on an ad hoc committee set up to advise the Governor of Kansas on the construction of a bridge over the Grand River. The choice was between a \$10,000,000 low bridge and a \$30,000,000 high bridge crossing for I-35. A decision had to be made rapidly. There had been considerable controversy over a dam that was being planned by the Corps of Engineers which, if built, would require the high bridge. As a result of the Governor's Conference the Remote Sensing Lab was asked to assist the committee. Sludge markings left from the 200 year flood defined the area that would be inundated. A fast cost/benefit analysis based upon the ERTS imagery and some additional aerial photography showed that the costs (primarily loss of some of the richest farmland in Kansas) outweighed the benefits. The Corps of Engineers cooperated in the study and with this additional data they abandoned the project. The low bridge was approved at a savings of \$20 million.

CONTACTS

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University of Kansas Space
Technology Center
Kansas State University
Kansas Geological Survey

Kansas Environmental Resource Studies Program (KERS):
The Space Technology Center is coordinating this program for assimilating, analyzing and disseminating ERTS-type data to State, local, and regional operating agencies. Principal State user agencies involved have been the Highway, Park and Recreation, Water Resources Board, Biological Survey, and the Dept. of Economic Development. All of the following projects have developed out of this program.

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Kansas (continued)

State Board of Agriculture
Dept. of Economic Development
(U.S. Dept. of Agriculture)

An eight county ERTS-derived land-use map of North Central Kansas was prepared and distributed to state agencies and other potential users. Users have provided additional ground truth which is being incorporated in later maps and are using their maps in highway planning, forest conservation, plant siting, and general land-use planning. This program is presently being evaluated and is likely to be continued and expanded. Coordinator of this project, which includes more than remote sensing and map-making, is James Harbiger of the Soil Conservation Service.

1, 2

Forestry, Fish and Game
Commission
Remote Sensing Laboratory

Wildlife Habitat Inventory of Kansas (demonstration project) has been completed to see how satellite and high altitude MSS monitoring can be incorporated into the management system of this agency. Presently only one game manager must manage 30 square miles of water-fowl protected area where the water level/ecological balance is critical and requires constant monitoring. Presently looking for additional support from the State Board of Agriculture and the legislature (\$2,000,000 proposal).

3

Kansas Water Resources Board

The feasibility of using ERTS imagery to determine the long term effects of growing and changing irrigation practices on the Wichita Municipal Water Supply has been proven. Irrigation practices on private land holdings are of critical importance to the management and allocation of water resources in Kansas but State law bars effective ground monitoring without permission. Combined satellite and A/C coverage can solve this problem and the Board is now asking for additional funding to extend this program.

4

Kansas (continued)

Dept. of Economic Development

A fourteen category land-use map of the entire state distributed by the D.E.D. will be used by all State agencies. Prepared in 1972 from early ERTS data, it was updated in 1974 and they expect to keep map current by means of a coordinated ERTS/Aircraft/Ground program.

4

Dept. of Economic Development

Automatic updating of land-use records by ERTS digital tape: The feasibility of using tapes to automatically update several categories of land-use has been demonstrated and could be used in documenting change in an ERTS-type operational system. However cost/benefit studies indicate the machine cannot, as yet, compete with manual analysis. They expect machine analysis to become practical in a few years and will continue to monitor developments.

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Dept. of Highways
Remote Sensing Laboratory

The Remote Sensing Laboratory and the Highway Dept. are presently trying to develop a program to determine agricultural loading on state highways. Road maintenance and construction budgets have been cut drastically and the Highway Dept. wants to know where it can best allocate its funds. In thinly populated areas, traffic counts are meaningless. By observing agricultural patterns they hope to determine which highways and feed roads are most critical in bringing agricultural products to market.

1

Kansas Forestry Service
State Planning Districts
Remote Sensing Laboratory

In addition to the foregoing, more structured programs, the Remote Sensing Laboratory is working with the Forestry Service and various planning districts on the application of remote sensing to their problems. Currently, for instance there appears to be a growing infestation of red cedar and sagebrush in the grazing lands of Southern Kansas.

(continued)

Kansas (continued)

Little quantitative data is available and the Remote Sensing Laboratory expects to be able to provide this data. Urban studies are also being conducted in the Kansas City (both Kansas and Missouri) region and 3-day workshops have been held for state and regional planners.

CONTACTS:

1. B. G. Barr, Space Technology Center, University of Kansas, Lawrence, Kansas 66045, (913) 864-4775.
2. James Harbiger, Soil Conservation Service, USDA, Minneapolis, Kansas.
3. Bruce Waddell, Kansas Forestry, Fish and Game Commission, Box 1028, Pratt, Kansas 67124.
4. Don Williams, Space Technology Center, University of Kansas, Lawrence, Kansas 66045, (913) 864-4775.
5. Robert Haralick, Space Technology Center, University of Kansas, Lawrence, Kansas 66045.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Kentucky

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

Department of Natural Resources
and Environmental Protection
University of Kentucky

ERTS Experiment: Monitoring and inspection of surface mining operations. Work is being done at Univ. of Kentucky but is closely monitored by Dept. of Natural Resources. State does not want to invest heavily in technology now but wants to stay abreast of technology now and is looking to the universities for guidance and advice. See "Training" below.

1, 2, 3

Department of Natural Resources
and Environmental Protection
Eastern Kentucky University
Appalachian Regional Commission

Appalachian Regional Commission Study: Surface Mine Pollution Abatement and Land Use Impact investigation. APR funded study is being conducted by Eastern Kentucky University.

1, 2, 4

Department of Natural Resources
and Environmental Protection
University of Kentucky
NASA Earth Resources Laboratory,
Bay St. Louis, MO

Training and transfer of technology. Kentucky is not investing heavily in remote sensing but Dept. of Natural Resources is following developments closely. They look to the universities for guidance and staff members attend seminars and briefings. There is cooperation between the Bay St. Louis, NASA Lab., agency and university people on a number of smaller projects such as the use of CCT for locating and measuring water impoundments and other watershed monitoring activities. Dr. Graves is attempting to form a consortium or some type of organization to better coordinate these activities.

3

CONTACTS:

1. Robert E. Nickel, Chief, Office of Planning and Research, Department of Natural Resources, Frankfort, Kentucky 40601, (502) 564-7320.
2. William Kelly, Office of Planning and Research, Dept. of Natural Resources, Frankfort, Kentucky 40601, (502) 564-7320.
3. Donald Graves, Dept. of Forestry, Univ. of Kentucky, Lexington, Kentucky 40506, (606) 258-2906.
4. William Adams, Eastern Kentucky University, Richmond, Kentucky, (606) 622-2616.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Louisiana

COOPERATING ORGANIZATIONS

Technology Transfer Office
Office of State Planning

PROGRAM/STATUS/RESULTS

This office represents Louisiana in a consortium with Mississippi and NASA. The office acts as a broker and clearinghouse of technology developed at NSTL and other federal centers. Charles F. D'Agostino's primary responsibility, besides administering the office, is to act as liaison officer between state and federal agencies. His office is working closely with the State of Mississippi and NASA co-participants in this technology transfer program, in developing joint projects for the two states. Areas under consideration include transportation, mass transit, energy, recreational and park planning and coastal zone management. Some LANDSAT related projects and the State agencies concerned are listed below.

1, 2

1. Disaster Relief Study for the La. Shrimp Industry - Louisiana Wild Life and Fisheries Commission. This is a project using LANDSAT and A/C imagery to analyze flood damage in 1972.
2. Expanded Data Management System - La. Wildlife and Fisheries Commission. Not specifically LANDSAT oriented, this is a project for developing and applying a software program for accumulating, sorting and analyzing data. NASA/NSTL and NASA/Slidell Computer Complex are involved.
3. Design and Implementation of a Plan for Adjustment of Louisiana Ad Valorem Tax Millages - Louisiana Tax Commission. This is a project for evaluating tax mapping techniques available to the State from the private sector. NASA/JSC and USGS-EROS are involved.

CONTACTS

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Louisiana (continued)

4. Study of the West Pearl River Navigation Channel - Governor's Council on Environmental Quality. Primarily a high altitude A/C study for planning purposes involving NASA/NSTL and USGS/EROS.
5. Tracing of the Plume from the Incinerator Ship, Vulcanus - Governor's Council on Environmental Quality. Used LANDSAT imagery to trace burning chlorinated hydrocarbons off the Coast of Cameron, Louisiana. NASA/JSC, USGS/EROS and EOA/NSTL involved.
6. Technical Support for Land Use Mapping - The Rapides Area Planning Commission. Primarily oriented towards the use of IR photography, this project provided technical assistance to the RAPC by providing processing and training in the use of remote sensing in land-use planning.
7. Study of Salt Water Intrusion on the Red River - Governor's Office. A project using ground truth and remote sensing to determine the extent and effect of salt water intrusion from the North Louisiana salt domes. NASA/NSTL and JSC and USGS/EROS are involved.
8. Technical Assistance for Urban Mapping - The University of New Orleans. Training will be provided and techniques developed for an urban mapping system for the State. NASA/NSTL, USGS, and NASA/JSC are involved.
9. Base Map Digitization and Thematic Overlays of New Orleans Traffic Zones - The University of New Orleans, the Orleans Regional Planning Commission, and the Office of State Planning. This is part of item 8 above for which funding has been provided.
10. Technical Assistance in Planning a Route for a North-South Expressway in La. - La. Dept. of Highways. Used LANDSAT imagery in selecting a route for the expressway. USGS/EROS and NASA/JSC involved.

Louisiana (continued)

Note that the Office of Technology Transfer serves as liaison between state and federal agencies. Actual involvement in projects may be minimal and the Office of State Planning and other agencies may have a more important role in implementing policy. The reorganization of the State agencies mandated by the new State constitution have not been really implemented as yet and they will likely have a strong positive effect in promoting technology transfer.

Center for Wetlands Resources

This Center has worked with many state and regional agencies on possible applications of remote sensing to the mapping and monitoring of Louisiana's coastal lands. It is supported in part by the Office of Sea Grant, NOAA and is very much concerned with the environmental planning of La.'s Superport and other marine wetlands and flood plain problems. Jack Van Lopik, its Director promotes Sea Grant objectives throughout the State and serves in an advisory role to the State agencies and administers Sea Grant programs in all the state universities. As a consequence of constitutional changes and the reorganization of the State government together with the organization of the Technology Transfer Office, the Center may have a larger impact on operational activities of the State agencies. 3

Joint Legislative Committee on
Environmental Quality
Geosciences Dept., LSU

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Anthony Lewis completed a study and inventory of the map and remote sensor coverage of Louisiana. Included in the map and remote sensor inventory were: 1) The producers and users of this type of data. 2) The types and scales of available maps and remote sensor imagery. 3) The deficiencies on a regional, type and scale basis in the coverage available. 4

Louisiana (continued)

This study was prepared before the agencies were reorganized. It covered agency needs in considerable depth, pointed out deficiencies and made strong recommendations. He is presently doing some photo-interpretive work for the Louisiana Joint Legislative Committee on Environmental Quality. Primarily A/C but some ERTS imagery will be used in this planning study.

Louisiana Environmental Management System (LEMS)

LEMS consists of a data bank and a small technical staff that assists the legislature and State agencies. Donald Harang has had considerable remote sensing experience and works closely with NASA, EROS, and the Technology Transfer Office. The LEMS staff respond in answer to any questions or lack of knowledge in the environmental area. They point out gaps in knowledge and suggest how the answers may be provided. The land-use planning study being conducted by Anthony Lewis (see previous project) is part of a larger JLCEO/LEMS study. The LEMS staff may well play an important role (through their recommendations) in the restructuring of the State government.

5, 6

CONTACTS:

1. Charles F. D'Agostino, Manager, Technology Transfer Office, NASA/NSTL, Building 1100, Rm. A-213, Bay St. Louis, Mississippi 39520, (601) 688-4322.
2. Eddie L. Schwartz, Jr., Land Use Planning Coordinator, Office of the Governor, P.O. Box 44425, Capitol Station, Baton Rouge, La. 70804, (504) 389-2494.
3. Jack Van Lopik, Director, Center for Wetlands Resources, LSU, Baton Rouge, La. 70803, (504) 766-3300.
4. Anthony Lewis, Geosciences Dept., LSU, Baton Rouge, La. 70803, (504) 388-5302.
5. Donald Harang, Senior Environmental Analyst, Louisiana Environmental Management System, 1010 Gause Blvd., Slidell, La. 70458, (504) 255-6481.
6. Donald Waittinghill, Director, La. Environmental Management System, P.O. Box 44033, Baton Rouge, La. 70804

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Maine

COOPERATING ORGANIZATIONS

Dept. of Transportation

Other Agencies

PROGRAM/STATUS/RESULTS

Two ERTS-1 investigations (1) Effect of highway construction on water run-off and (2) Vegetation damage associated with highway construction pleased investigators but U-2 photography was far more useful to them than ERTS imagery. U.S. Dept. of Transportation followed experiments with view toward nationwide application. Might have had more impact if original investigator (Ernest Stoeckeler) had not been stricken with cancer. Imagery supplied ERTS investigators has been loaned to other state agencies such as the Bureau of Geology in the Dept. of Conservation. Interested in gathering additional imagery even if not approved as ERTS investigators. Have very limited equipment and budgets and interpretive techniques are very unsophisticated.

Maine Dept. of Environmental Protection

Commissioner Adams is a representative on the New England River Basin Commission. Dartmouth College is using LANDSAT imagery in land use studies being done for state planning agencies in New Hampshire and is attempting to extend this work to cover the whole of New England under the aegis of the NERBC.

CONTACTS:

1. Raymond G. Woodman, Bureau of Highways, Materials and Research Division, Box 1208, Gangor, Maine 04401, (207) 942-4868.
2. William R. Adams, Jr., Commissioner, Dept. of Environmental Protection, Augusta, Maine 04330, (207) 289-6321.

CONTACTS

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Maryland

COOPERATING ORGANIZATIONS

Dept. of State Planning

PROGRAM/STATUS/RESULTS

CONTACTS

The Dept. of State Planning is responsible for coordinating 1, 2 and assisting state and regional agencies in utilizing LANDSAT-type data. It operates MAGI - The Maryland Automatic Geographic Information System. Although LANDSAT imagery has been used to prepare watershed and thematic maps they have relied far more on high-altitude A/C (NASA has provided extensive coverage.) and want greater resolution in the satellite imagery. Very satisfied with Skylab resolution and feel that 90% of A/C coverage could be eliminated if resolution comparable to this could be provided on a regular basis.

Dept. of Environmental Health

This Dept. is attempting to apply the results of earlier NASA studies (P. Cressy and J. Schubert, Code 923, GSFC) to the detection and monitoring of organic pollution and sedimentation in the Potomac River and Chesapeake Bay. First attempts were not very successful but later results have been much more encouraging.

3, 4

**Md. Geological Survey
EarthSat**

The geology, mineral, and water resources were mapped in 5, 6 an ERTS-1 investigation. An ERTS follow-on proposal was not accepted and while the products of the original investigation are being used it is unlikely that the State will pursue this further on its own. The Md. Geological Survey's small budget and relatively unsophisticated equipment are strong limiting factors.

Md. Bureau of Mines

Strip-mine monitoring: NASA/Goddard has been working 7 with the Bureau of Mines demonstrating the practicality of monitoring strip-mines and reclamation efforts. Results have been very encouraging but it is doubtful that Maryland will do much with this on its own.

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Maryland (continued)

Dept. of Natural Resources
Anne Arundel County
Smithsonian Institution
NASA/WFC

The Dept. of Natural Resources has worked with the Smithsonian Institution and NASA on a wetlands mapping project. Present status uncertain.

8

USGS/Reston
All State Agency Users

Kenneth McGinty has been responsible for the user evaluation module of U.S.G.S.'s CARETS regional survey and environmental impact experiment. He has maintained contact with user institutions throughout the investigation. Conferences, workshops, and questionnaire interviews were held to familiarize users with the range of products and services available, and to receive feedback on usefulness.

9

CONTACTS:

1. Edwin Thomas, Director of Comprehensive State Planning, Md. Dept. of State Planning, 301 West Preston Street, Baltimore 21201, (301) 383-2455.
2. John Antonucci, Md. Dept. of State Planning, 301 West Preston Street, Baltimore, Md. 21201, (301) 383-2472.
3. Max Eisenberg, Md. Dept. of Environmental Health, Annapolis, (301) 383-2365.
4. P. Cressy, Code 923, GSFC.
5. Emery Cleaves, Md. Geological Survey, Annapolis, (301) 235-0771
6. T. Slaughter, Md. Geological Survey, Annapolis, (301) 235-1792.
7. Art Anderson, NASA, Code 923, GSFC, 982-5240.
8. Dave Oberholter, NASA, WFC, (804) 824-3411.
9. Kenneth McGinty, U.S.G.S., Reston, VA, (703) 860-7000.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Massachusetts

COOPERATING ORGANIZATIONS

Department of Natural Resources
New England River Basin Comm.
Corps of Engineers

PROGRAM/STATUS/RESULTS

Massachusetts agencies have not made direct use of ERTS imagery. They have used products made by others and are cooperating with the Corps of Engineers in its reservoir management studies. However Commissioner Brownell is Massachusetts representative on the New England River Basin Commission which will be funding regional land use studies. Richard Tellock (was formerly with NASA Apollo program), is a supporter of the ERTS program, has many contacts with uses of remote sensing products in Mass., and should be receptive to possible applications in coastal zone management.

CONTACTS

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CONTACTS:

1. Arthur W. Brownell, Commissioner, (617) 327-3170.
2. Richard Tetlock, Program Coordinator for Coastal Zone Management, Dept. of Natural Resources,
100 Cambridge Street, Boston, Massachusetts 02202, (617) 327-3188.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Michigan

COOPERATING ORGANIZATIONS

State Planning Division of
Bureau of Programs and
Budget
Office of Land Use, Dept.
of Natural Resources
Michigan State University
West Michigan Regional Planning
Commission
Land Information System
Committee

Dept. of State Highways
ERIM

Oakland County Planning
Commission
Bureau of Outdoor Recreation,
Dept. of Natural Resources
ERIM

Dept. of Natural Resources
EPA
Bendix Aerospace Systems
Division

PROGRAM/STATUS/RESULTS

Statewide land use classification system: A seven category land use map was prepared based on ERTS and other available data. The Land Information System Committee formed by the above agencies was going to investigate the feasibility of developing an integrated land use system but at this time nothing is being done and it is unlikely that there will be any action here until the automobile industry and Michigan's economy are restored to health.

ERTS and RB-57 imagery have been used in selection of highway corridors and utility sites. Work was primarily with A/C but ERTS data can now be incorporated in the States transportation analysis model. With budget cutting now taking place this work is not likely to be followed up in the near future.

Dr. Sattinger has been negotiating with these agencies a possible quasi-operational application of his ERTS-1 and other NASA supported studies. Funding is the major problem.

Bendix has produced ERTS computer-generated map overlays of lake watersheds at scales of 1:250,000 and 1:48,000 for these agencies. They have demonstrated the feasibility of monitoring changes in watershed land use in a timely and inexpensive manner. (Estimate 10 cents per square mile.) Work is now underway in other watersheds. This is one area where Michigan may invest some of its own money.

CONTACTS

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Michigan (continued)

CONTACTS:

1. Buzz Sellman, ERIM, Ann Arbor, Michigan 48113, (303) 483-0500.
2. Irvin J. Sattinger, ERIM, Post Office Box 618, Ann Arbor, Michigan 48107.
3. John Byelich, Bureau of Outdoor Recreation, Dept. of Natural Resources, Lansing, (517) 373-1263.
4. Robert H. Rogers, Bendix Aerospace Systems Division, Ann Arbor 48107, (313) 665-7766.

Note: Michigan has been extremely hard hit by the current economic recession. A number of remote sensing projects that appeared to be imminent a year ago have been postponed indefinitely.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Minnesota

COOPERATING ORGANIZATIONS

Minnesota State Planning Agency
University of Minnesota
Metropolitan Council
County Land Commissioners
Dept. of Iron Range Resources
and Rehabilitation
U.S. Forest Service
USDI Bureau of Fisheries
U.S. Soil Conservation Service
Others in both public & private
sectors

Minnesota State Planning Agency
University of Minnesota
Others

Minnesota State Planning Agency
University of Minnesota

Department of Natural Resources
Remote Sensing Laboratory of
University of Minnesota
Minnesota State Planning Agency

PROGRAM/STATUS/RESULTS

An ERTS-1 investigation, a cooperative effort by agencies to the left lead by Univ. of Minnesota. Investigators are pleased at the possibility of incorporating ERTS-type data into the Minnesota Land Management Information System (MLMIS) and using it to maintain information current. See Training and Technology Transfer below.

Follow-on experiment: An investigation into the potential of ERTS data as input to state land use system. See Training and Technology Transfer below.

Study of turbidity patterns in Duluth-Superior Harbor. Results are applicable to dredging operations and anti-pollution measures. See Training and Technology Transfer below.

Dept. of Natural Resources Training and Technology Transfer Program. Other than the above experimental projects the Minnesota operating agencies have made little use of ERTS data. However the Dept. of Natural Resources has Planning and Review Teams that have been meeting frequently with University investigators and staff members have been following closely developments in remote sensing. Currently the Remote Sensing Laboratory of the College of Forestry has a contract to develop recommendations as to the most effective use of remote sensing. Report is due in August 1975.

CONTACTS

1, 2, 3

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Minnesota continued:

Minnesota State Planning Agency

Coordination of remote sensing activities: Eugene Carel 6
is assisting local and regional authorities in applying
remote sensing technology to their problems and in
coordinating their efforts with that of the state agencies.
Seminars and training courses will be conducted by the
University of Minnesota (Merle Meyer) and they wish to
coordinate their efforts with federal as well as state
agencies.

CONTACTS:

1. Joseph Sizer, Minnesota State Planning Agency, 802 Capitol Square Building, St. Paul, Minnesota 55101, (612) 296-3985.
2. Dwight Brown, Dept. of Geography, Univ. of Minnesota, Minneapolis, Minnesota 55455, (612) 373-5479.
3. Merle P. Meyer, College of Forestry, University of Minnesota, St. Paul, Minnesota 55101, (612) 373-0830.
4. Michael Sydor, Lake Superior Basin Studies Center, Univ. of Minnesota, Duluth, Minnesota 55812.
5. John Poate, Dept. of Natural Resources, Capitol Square Building, St. Paul, Minnesota 55101, (612) 296-4798.
6. Eugene Carel, Environmental Planning Section, Minnesota Planning Agency, 100 Capitol Square Building, St. Paul, Minnesota 55101, (612) 296-2559.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Mississippi

COOPERATING ORGANIZATIONS

Miss. Office of Science and Technology (Governor's Liaison Office)
Miss. Resource & Development Center
State Forestry Commission
State Game and Fish Commission
Board of Water Commissioners
Marine Resources Council
Park Commission
Miss. Geological Survey
Highway Commission
Air & Water Pollution Commission
NASA/ERL

PROGRAM/STATUS/RESULTS

Natural Resources Inventory System LANDSAT follow-on experiment. This project is viewed by the State as the start of a first generation fully automatic permanently operating resource management system. The State agencies listed are cooperating in developing specific applications in the areas of land-use, transportation network sitings, water resources, wildlife habitats and timber resources. The system will be available to all State agencies. The system is planned to eventually include computers software programs, display equipment and data storage and retrieval equipment but in the initial phase a manual system is being used. Major data sources will be MSS data from satellites and A/C with correlation information from other sources. The Research and Development Center, an agency of State government, is the lead agency in setting up an automated system. The Office of Science and Technology is the final decision-making authority for work to be performed by the various State agencies.

Miss. Office of Science and Technology (Technology Transfer Office)

This office represents Mississippi in a consortium with Louisiana and NASA. The office acts as a broker and clearinghouse of technology developed by NASA and other Federal agencies. It will serve the private sector and other states as well as the Mississippi agencies. This project and the one previously described are closely intertwined with Preston Bankston heading both.

CONTACTS

1, 2, 3

1, 2, 3, 4

Mississippi (continued)

CONTACTS:

1. Preston T. Bankston, Director, Office of Science and Technology, Watkins Building, Suite 403, 510 George Street, Jackson, Mississippi, (601) 354-6517.
2. Robert D. Piland, NASA/ERL/NSTL, Bay St. Louis, Mississippi 39520, (601) 688-4254.
3. A. T. Joyce, NASA/ERL/NSTL, Bay St. Louis, Mississippi 39520, (601) 688-4254.
4. Volney Cisna, Manager, Mississippi Office of Science and Technology, NASA/NSTL, Building 1100, Rm. A-213, Bay St. Louis, Mississippi 39520, (601) 688-3047.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Missouri

COOPERATING ORGANIZATIONS

Dept. of Natural Resources
Cartographic Data & Remote
Sensing Center (DCRSC)
Inter-Departmental Council
for Natural Resources
Information (IDCNRI)

Dept. of Natural Resources
Division of Geological Survey
Water Resources (Geological
Survey)

Missouri Geological Survey
USGS

Dept. of Natural Resources
Dept. of Conservation
U.S. Forestry Service

Geological Survey
Corps of Engineers
U.S. Agricultural Stabilization
and Conservation Service

Dept. of Natural Resources
NASA Earth Resources Laboratory,
Bay St. Louis, Missouri

PROGRAM/STATUS/RESULTS

Planning for CDRSC, a centralized remote sensing center serving all state agencies under the control of the IDCNRI, is well advanced but implementation is proceeding slowly primarily because of scarcity of funds. Hope to coordinate its activities with the USGS Topographic Mapping Complex "User Service Center" at Rolla.

Statewide inventory and geological survey (soils and land-use classification, structural features, flood areas, soil drainage systems, etc.). Highly pleased with results - would do more but are limited by funds and manpower.

LANDSAT-1 mosaic of Missouri was prepared with assistance from USGS Topographic Division and is being distributed by the Department of Natural Resources.

Northern Missouri River Basin Tributary Study. Forests in 20 counties have been inventoried under grants by U.S. Forest Service. Establishing long term trends by comparing with studies made in the 30's and want repetitive coverage for continual monitoring of forest lands.

Under National Dam Safety Act (P.L. 92-367) Missouri Geological Survey inventoried dams in Missouri for the Corps of Engineers. Highly successful, cost effective program based on LANDSAT and ASCS supplied aerial photography.

Springfield Land Use Mapping Experiment: A test of NASA developed mapping procedures. Expect to use digital data supervised pattern recognition software in land use inventory.

CONTACTS

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1, 2, 3

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Missouri continued:

Dept. of Natural Resources,
Geological Survey

A level 1 land-use classification of St. Charles County
was made in six hours by one person. Conventional methods
would take nine months.

Dept. of Natural Resources
Geographical Applications
Program (GAP), U.S. Dept. of
the Interior

Cooperated with GAP in their Ozarks Regional Land-Use
Program. GAP used classified photography but can use
LANDSAT imagery to monitor and update their land-use
inventory.

Dept. of Natural Resources,
Geological Survey

Low cost image processing techniques: Lack of funds and
sophisticated equipment have necessitated the development
of new approach. Example: enhancement of LANDSAT imagery
using drachrome imagery. Although process has some
shortcomings images can be enhanced at a cost of \$2.00
per frame.

Missouri Geological Survey
University of Missouri

Short courses on remote sensing have been conducted for
State employees with emphasis on applications in their
respective agencies.

CONTACTS:

1. Dr. Wallace B. Howe, Director, Research and Technology Information Division, Missouri Department of Natural Resources, (314) 364-1752.
2. James A. Martin, Principal Investigator, Geological Survey, Buehler Park, Rolla, Missouri 65401, (314) 364-1752.
3. Jerry P. Vinyard, Geological Survey, Buehler Park, Rolla, Missouri 65401, (314) 364-1752.
4. Marvin Nodiff, Director, Division of Planning and Policy Development, Dept. of Natural Resources, P.O. Box 176, Jefferson City, Missouri 65101. (314) 751-4952
5. Dave Rath, Missouri Department of Natural Resources, (314) 364-1752.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Montana

COOPERATING ORGANIZATIONS

Dept. of Conservation and
Natural Resources

Montana Energy Council

Others

Federation of Rocky Mountain
States

Dept. of Conservation and
Natural Resources

Other State Agencies

PROGRAM/STATUS/RESULTS

Federation of Rocky Mountain States LANDSAT Follow-on Experiment: Montana is a member of the Federation and state agencies will provide ground truth and expect to make immediate use of experiment results in their land use planning. Lt. Governor William Christensen, as Director of the Montana Energy Advisory Council is directly involved in this project and similar efforts.

LANDSAT-1, Skylab, and U-2 imagery have been used in mapping forests and reservoirs. State was - and is - in desperate need of additional data for land use planning. Results were most gratifying except a determination of most suitable power line corridors could not be finished because of a curtailment of U-2 underflights. Dept. of Conservation and Natural Resources works closely with other state and local agencies and tries to provide basic data for land-use planning.

CONTACTS

1, 2, 3

2

CONTACTS:

1. Lt. Gov. William Christensen, Director of Montana Energy Council, Rm. 104, State Capitol, Helena Montana 59601.
2. Lee F. Werth, Energy Planning Division, Dept. of Conservation and Natural Resources, Helena, Montana, 8-(406)-449-3780.
3. George Nez, Federation of Rocky Mountain States, Inc., 2480 West 26th Street, Denver, Colorado 80211. (303) 458-8000.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Nebraska

COOPERATING ORGANIZATIONS

Nebraska Remote Sensing Center

PROGRAM/STATUS/RESULTS

CONTACTS

The Conservation and Survey Division of the University of Nebraska, Lincoln, includes the State Geological Survey and the Nebraska Remote Sensing Center. The Center coordinates all State agencies activities in remote sensing. It has published Level 1 land use maps of Nevada from ERTS data and more detailed Level 2 land-use maps of selected areas. Land-use data for 640 acre sections have been compiled for computer manipulation and computer mapping. The Remote Sensing Center is concentrating its research efforts on producing low cost "user products" while closely following the development of more sophisticated techniques elsewhere so that they can be utilized by decision-makers in the user community as they become cost effective.

1

Remote Sensing Center
State Office of Planning and
Programming
Nebraska Natural Resources
Commission

Maps prepared by the Remote Sensing Center have been used by these agencies in preparing recommendations for developing land-use planning legislation and have been included as part of the land inventory of the Nebraska State Water Plan.

1

Remote Sensing Center
Nebraska Dept. of Agriculture

The practicality of inventorying center pivot irrigation systems from ERTS imagery has been demonstrated. Fields have also been classified as alfalfa, wheat, wetland, pasture, range and pasture, non-irrigated row crops, and irrigated corn. Much of Nebraska's agriculture depends upon irrigation and knowledge of the number of center pivots and their location is of critical importance in the management of water and energy. This work is being expanded beyond the first five counties selected.

1, 2

4/17/75

Nebraska (continued)

Remote Sensing Center
Nebraska Dept. of Environmental
Control

Nebraska Reservoir Water Quality Project: It is
economically impossible to monitor the water quality
of Nebraska's thousands of small bodies of water. They
are seeking to do it by remote sensing.

1

Nebraska Geological Survey

The Geological Survey is conducting a LANDSAT follow-on
investigation to see how LANDSAT imagery can be used to
assist groups interested in ground water, gas storage,
oil exploration, construction, and the location of power
plants.

3

CONTACTS:

1. Rex Peterson, Remote Sensing Center, Conservation and Survey Division, University of Nebraska, Lincoln 68509, (402) 472-3471.
2. Glenn Kreuscher, Director, State Dept. of Agriculture, Lincoln 68509, (402) 471-2311.
3. Marvin P. Carlson, Director, Nebraska Geological Survey, University of Nebraska, Lincoln 68509, (402) 472-7211.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Nevada

COOPERATING ORGANIZATIONS

University of Nevada
Dept. of Conservation and
Natural Resources
State Division of Water
Resources

PROGRAM/STATUS/RESULTS

The University of Nevada has conducted several ERTS investigations and have prepared photomaps of Nevada. The above and other state agencies have cooperated to a limited extent in some of these investigations by providing some ground truth and have used some research products to a limited extent. Real involvement is minimal.

CONTACTS

1, 2, 3

CONTACTS:

1. Jack G. Quade, University of Nevada, Reno, (702) 784-5911 or 784-6618.
2. Dr. Elmo DeRico, (702) 784-5911.
3. Robert Erickson, Land Use Planning Agency, Reno, (702) 885-4360.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: New Hampshire

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

(No direct State participation. Some State agencies are making use of land-use maps prepared by 1. 2 Simpson of Dartmouth and have cooperated with USGS and Corps of Engineers ERTS investigators but their real involvement is minimal.)

CONTACTS:

1. Robert B. Simpson, Dartmouth College, Hanover, New Hampshire.
2. Glenn W. Stewart, New Hampshire Geological Survey, University of New Hampshire, Durham, N.H.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: New Jersey

COOPERATING ORGANIZATIONS

New Jersey Dept. of Environmental Protection

Delaware River Basin Commission
(N.J., N.Y., Del., & Pa.)

USGS

Army Corps of Engineers
NASA

USGS/Reston
New Jersey Dept. of Natural Resources & Environmental Control

PROGRAM/STATUS/RESULTS

In an ERTS-1 experiment, this Dept. proved to its own satisfaction, that it could effectively use ERTS to effectively monitor the coastal lands of N.J. It now wants to operate a quasi-operational surveillance system but lacks funds and would need a faster turn-around time than the normal ERTS investigator receives. An ERTS follow-on proposal was not accepted by NASA. It is now looking for support elsewhere and has received some help from USGS which is doing some digital tape analysis for them as well as providing other assistance. In view of the current economic recession it is unlikely that the Environmental agency will get any more funds for this program from the State so that it will likely die without federal support.

State and regional agencies are cooperating in the development of a reservoir management system based upon the use of satellite imagery and DCS links. 2, 3

Kenneth McGinty has been responsible for the user evaluation module of USGS's CARETS regional survey and environmental impact experiment. He has maintained contact with user institutions throughout the investigation. Conferences, workshops, and questionnaire interviews were held to familiarize users with the range of products and services available, and to receive feedback on usefulness. The CARETS Information Center (CIC) provided free access to remote sensor data and project products. Lack of funding did not permit (continued) 4

New Jersey (continued)

such services as imagery reproduction, search and retrieval assistance and imagery interpretation assistance as had been planned. Recommendations resulting from the evaluation reflect what they feel is the need to establish a flexible and reliable system for providing more detailed raw and processed land resource information as well as the need to improve the methods of making information available to users. In addition some users have asked the USGS to devote more effort toward educating potential users in the use of new data products.

CONTACTS:

1. Edward B. Feinberg, Dept. of Environmental Protection, Trenton 08625, (609) 292-2885.
2. David Bardeen, Commissioner, Dept. of Environmental Protection, Trenton 08625, (609) 292-5385.
3. Brendan T. Byrne, Governor, State of New Jersey, (N.J. Representative of the Delaware River Basin Commission) State House, Trenton 08625.
4. Kenneth McGinty, USGS, Reston, Virginia, (703) 860-7000.

7/11/75-rev.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: New Mexico

COOPERATING ORGANIZATIONS

State Office of Planning
Technology Application Center
(TAC), Univ. of New Mexico
State Bureau of Mines and
Mineral Resources

PROGRAM/STATUS/RESULTS

These three agencies have primary responsibility for determining how satellite data may best be used on an operational level by the State agencies. (The Bureau of Mines and Mineral Resources is part of the New Mexico Institute of Mining and Technology - formerly the School of Mining.) The Bureau and TAC carried out an ERTS-1 investigation and now have a follow-on. They feel that the potential value of ERTS in mineral exploration has been demonstrated and expect to use it in developing the state's mineral and geothermal resources. TAC serves as a central repository for all remote sensing imagery and provides training, consultation and service to the user agencies and the general public.

CONTACTS

1, 2

CONTACTS:

1. Ms. Greciela Olivarez, Director, State Planning Office, 403 State Capitol, Santa Fe, New Mexico 87501, (505) 827-2315.
2. Karl Vonder Linden, New Mexico Institute of Mining and Technology, Socorro, New Mexico 87801.

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4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: New York

COOPERATING ORGANIZATIONS

Resources Information Laboratory
Department of Natural Resources

PROGRAM/STATUS/RESULTS

Land-use inventory: The Resources Information Lab. is supported by the University and the Department of Natural Resources. It serves as a principal source of information on land use data in New York State. In addition it carries out original research relative to resource management and provides varied services to users of resource information. This ranges from advice concerning a problem to carrying out major research and inventory problems. It carried out an ERTS-1/Skylab land-use investigation the results of which were incorporated in LUNR - the Land-Use and Natural Resource Inventory of New York State. It provides technical assistance and project support to a wide range of state and local units involved in resource planning, environmental management, and educational programs throughout the state. It has set up training programs state-wide for county agents, conservation commissioners, and councils. It expected to get satellite resource information into use throughout the state to a significant degree by 1977. It has spent \$250,000 in assembling a group of remote sensing specialists - perhaps the only group available in New York for state-wide applications of remote sensing. It is scheduled to be closed out at the end of May for lack of support.

CONTACTS

1

New York Geological Survey

Completed an ERTS-1 investigation on land forms, geological structures, and mineral resources. Now working on a continuing study funded by USGS in which they will inventory all geologically "brittle structures" in New York. Information will be used by planners in locating nuclear plants, deep foundation structures (dams & bridges, etc.), tunnels, etc.

4/17/75

New York continued:

CONTACTS:

1. Ernest E. Hardy, Director, Resources Information Laboratory, New York State College of Agriculture and Life Sciences, Cornell University, (607) 256-6529.
2. Yngvar W. Isachsen, New York State Museum and Science Service, Albany, New York, (518) 474-5819.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: North Carolina

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

(NASA, the Corps of Engineers, USGS and other Federal agencies have used remote sensing in areas of concern to the State agencies. The State agencies have been cooperative but actual participation has been minimal. Charles Welby conducted an ERTS-1 investigation (Resource Survey/Regional Planning Study) and has tried to get State and regional groups to apply satellite sensing operationally.)

1

CONTACTS:

1. Charles W. Welby, North Carolina State University, Raleigh, N.C. 27602, (919) 737-2011.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: North Dakota

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

(Some Federal agencies and other have conducted remote sensing studies in North Dakota and products from these studies have been used by state agencies but it is doubtful that any other state has done less in using satellite studies. The State Geologist plans to send someone to Sioux Falls in the near future to study their technology.) 1

CONTACTS:

1. E. A. Noble, State Geologist, University of North Dakota, Grand Forks, North Dakota, (701) 777-2231.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Ohio

COOPERATING ORGANIZATIONS

Dept. of Economic and Community Development
Battelle, Columbus
GSFC
Other State Agencies

PROGRAM/STATUS/RESULTS

Ohio has a LANDSAT follow-on to develop a multi-disciplinary user program in the state. Previous study documented specific areas where satellite derived data would be used operationally and developed user awareness. Specific areas: surface mining and reclamation; suspended sediments and circulation patterns in water bodies; smoke plume and vegetation damage; land-use feature classification, mapping, and trend analysis; forest and agricultural inventories; and lake ice monitoring. An Ohio ERTS Data User Handbook was prepared and distributed to key people with resource management responsibilities throughout Ohio. This was followed by workshops and demonstration products for user agency personnel. Current project should lead into an operational system.

CONTACTS

1, 2

CONTACTS:

1. Paul Baldridge, Deputy Director, Dept. of Economic and Community Development, State Office Tower, 30 East Broad Street, Columbus, Ohio 43215, (614) 466-2480.
2. Paul Pincura, ERTS/Skylab Coordinator, Dept. of Economic and Community Development, State Office Tower, 30 East Broad Street, Columbus, Ohio 43215, (614) 466-2480.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Oklahoma

<u>COOPERATING ORGANIZATIONS</u>	<u>PROGRAM/STATUS/RESULTS</u>	<u>CONTACTS</u>
Oklahoma Geological Survey	The State agencies have not used ERTS imagery to any extent up till now but the Geological Survey wants to inventory all surface mining in Oklahoma. They expect to start this summer and are looking for financial and technical assistance from both State and Federal Agencies. Although the State's interest in remote sensing has been minimal, at least four oil companies (Citgo, Eason Oil, Phillips and Conoco) have been using ERTS imagery on a large scale in Oklahoma and there has been extensive coverage by other Federal agencies.	1

CONTACTS:

1. Charles J. Mankin, Oklahoma Geological Survey, University of Oklahoma, Norman, (405) 325-3031.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Oregon

COOPERATING ORGANIZATIONS

Task Force on Land Resource
Inventory of the Northwest
Regional Commission

NASA/Ames
USGS

Oregon Dept. of Land Conserva-
tion and Development
Environmental Remote Sensing
Laboratory, OSU
State, County and other local
agencies

PROGRAM/STATUS/RESULTS

This is a regional program (Idaho, Oregon, Washington) to incorporate information from satellite data as the principal basis for determination and quantification of land resources and land-use and for monitoring and quantifying land-use change and land management practices. Oregon views this as the start of a quasi-operational regional system which they hope will be fully operational by the late 1970's. The new Democratic Governor, Robert Straub, appears to be as committed to an operational ERTS-type system as former Governor McCall - and just as cost conscious. Dr. Roy Young is Science Advisor to the Governor but Dr. Shay has major role in advising on remote sensing matters.

The Land Conservation agency and many other agencies are consulting with Oregon State University staff on possible applications of remote sensing. But cost-effectiveness is the guide rule and they are not investing much money or manpower in these programs. They follow two guidelines: 1) Others can do the development work, and 2) serious investments in remote sensing should be done on a regional basis. See previous listing.

CONTACTS

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CONTACTS:

1. Roy Young, Vice President, Oregon State University, Corvallis 97331, (503) 754-3437.
2. Ralph Shay, Assistant Dean for Research and Science, Oregon State Univ., Corvallis 97331, (503) 754-3437.
3. Barry J. Schrumpf, ERTS P.I., Oregon State Univ., Corvallis 47331, (503) 754-3437.
4. Walter J. McCallum, Director, Planning Div., Dept. of Land Conservation & Development, 1175 Court St., N.E., Salem 97310, (503) 378-4926.
5. Harold Bruner, Ass't to the Governor for Natural Resources, Office of the Governor, Salem 97310, (503) 378-3109.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Pennsylvania

COOPERATING ORGANIZATIONS

Dept. of Environmental Resources
Office of State Planning
Governors Science & Advisory
Committee
EarthSat
Appalachian Regional Commission

PROGRAM/STATUS/RESULTS

Pennsylvania's LANDSAT follow-on proposal for a quasi-operational multidisciplinary demonstration experiment was not accepted possibly because the state did not propose to put up much of its own money. While the Office of State Planning (part of the Governor's Office) is the lead agency in land-use planning, the Dept. of Environmental Resources is attempting to coordinate all state remote sensing activities and is working closely with the Planning Office and university people. They hope to obtain state and other federal support for many of the activities outlined in their follow-on proposal. They are supporting EarthSat's LANDSAT mine subsidence experiment and have been cooperating with the Appalachian Regional Commissions study of regional remote sensing applications - and have received some funding from the ARC. William McGlade is the DER's representative on the Governor's Science and Advisory Committee (Robert Laughlin - formerly of HRB Singer and an ERTS supporter - Chairman) and is most knowledgeable of the details of the DER's activities. A state-wide land-use and information system will be developed if McGlade documents its usefulness in environmental monitoring.

1, 2, 3, 4

USGS/Reston
Kenneth McGinty has been responsible for the user evaluation module of USGS's CARETS regional survey and environmental impact experiment. He has maintained contact with user institutions throughout the investigation. Conferences, workshops, and questionnaire interviews were held to familiarize users with the range of products and services available, and to receive

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(continued)

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Pennsylvania (continued)

feedback on usefulness. The CARETS Information Center (CIC) provided free access to remote sensor data and project products. Lack of funding did not permit such services as imagery reproduction, search and retrieval assistance and imagery interpretation assistance as had been planned. Recommendations resulting from the evaluation reflect what they feel is the need to establish a flexible and reliable system for providing more detailed raw and processed land resource information as well as the need to improve the methods of making information available to users. In addition some users have asked the USGS to devote more effort toward educating potential users in the use of new data products.

CONTACTS:

1. William McGlade, Dept. of Environmental Resources, P.O. Box 1407, Harrisburg, PA 17120, (717) 783-1990.
2. George Kasparek, Deputy Director for Policy, Office of State Planning & Development, Capitol Building, Harrisburg, PA 17120, (717) 787-3798.
3. Robert Laughlin, Director, Office of Science & Technology, Pa. Dept. of Commerce, 412 South Office Building, Harrisburg, PA 17120, (717) 787-4147.
4. Thomas G. Fox, Governor's Science Advisor, Assistant Director, Mellon Institute, 4400 Fifth Avenue, Pittsburgh, PA 15213, (412) 621-1100 ext. 300.
5. Kenneth McGinty, USGS, Reston, VA, (703) 860-7000.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Rhode Island

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

(No state activity except for assisting the Corps of Engineers and perhaps some other federal agencies with ground truth. Moreover, except on a regional basis, they are not likely to become involved. Small size - same people do the planning for city of Providence and the State - and abundant A/C coverage obviate need for additional imagery.) 1

CONTACTS:

1. Dennis J. Murphy, Director, Dept. of Natural Resources, Providence, (401) 277-2776.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: South Carolina

COOPERATING ORGANIZATIONS

South Carolina Aerial Remote
Sensing Interagency Committee
(SCARSIC)

PROGRAM/STATUS/RESULTS

SCARSIC is a loosely organized group with representatives 1, 2, 3, from 15 to 18 State agencies who are very interested in 4, 5, 6, developing a strong state-wide remote sensing program. 7, 8 It has no official status with the State government but its leaders were responsible for a LANDSAT follow-on proposal to establish a central data base and information system which was not accepted. Apparently no major agency head or State political figure is willing to take the lead in developing a modern remote sensing program and resource data bank. SCARSIC had hoped that the proposed LANDSAT experiment would serve as a mechanism around which a State program could be developed and funded apart from any single agency. SCARSIC is also seeking legislative support and funding (prospects dim in view of current economy drive) and regional (Coastal Plains and the Appalachian Regional Commission) support. Roger Holmes was formerly with LARS/Purdue and has served on evaluation panels for ERTS proposals. Another likely reason for his selection as Chairman of SCARSIC is his neutral position vis-a-vis the various State agencies. Many, if not all, SCARSIC members are using LANDSAT products and are working with NASA and other Federal agencies on various problems. N. K. (Oley) Olson of the South Carolina State Development Board has a Skylab experiment (LANDSAT proposals not accepted) and the Water Resources Commission/EarthSat conducted a marine resource management LANDSAT experiment (follow-on not accepted) but any real operational system is likely to come about only through the efforts of the SCARSIC members. C. P. Guess and Olson, P.I.s of above experiments are also SCARSIC members.

CONTACTS

South Carolina (continued)

State Auditor's Office

The Auditor's Office has the State's best computer equipment and staff. Ted Taylor has been working with KSC and GE on adapting software and making the Image 100 compatible with their equipment. He also is working with staff of the Computer Center of the University of South Carolina and has the use of its facilities and is a member of SCARSIC (see project above). Major problem is getting financial support for remote sensing projects.

1, 3, 4

CONTACTS:

1. Roger A. Holmes, Dean, College of Engineering, University of South Carolina, Columbia, S. C. 29208, (803) 777-4177.
2. N. K. (Oley) Olson, South Carolina Development Board (Geology Dept.), Columbia, S. C. 29208, (803) 758-6431.
3. Jack Cooper, Computer Center, University of South Carolina, Columbia, S. C. 29208.
4. Theodore Taylor, Computer Systems Management, Columbia, South Carolina 29211, (803) 758-3578.
5. C. P. Guess, Jr., Director, South Carolina Water Resources Commission, 3834 Forest Drive, P.O. Box 4515, Columbia, South Carolina 29240.
6. G. B. Richardson, South Carolina Water Resources Commission, 3834 Forest Drive, P.O. Box 4515, Columbia, South Carolina 29240.
7. David Howell, South Carolina Geological Survey, Harbison Forest Road, Columbia, South Carolina 29210, (803) 758-6431.
8. Reed Barnett and D. Pope, NASA/KSC, Florida 32899, (305) 867-3017.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: South Dakota

COOPERATING ORGANIZATIONS

State Planning Bureau
Remote Sensing Institute
USDI/Sioux Falls
All State Agencies

PROGRAM/STATUS/RESULTS

State Land Use Demonstration Project: This is a LANDSAT follow-on experiment but the State views it as a program to set up an operational land use inventory system. According to Governor Kneip, they expect to cut the cost of assembling land-use information to 10% or less of the pre-ERTS technique. The Remote Sensing Institute has the primary responsibility for developing the system and is working closely with Sioux Falls. The Remote Sensing Institute, which is responsible for coordinating all remote sensing activities in South Dakota is also working with many other agencies and local groups on a variety of applications programs many of which are related to this land inventory project. Methods and procedures have been established to accomplish the following: 1) Compile soils association maps using ERTS imagery; 2) provide land-use and land-use potential maps as planning guides for resource development of this area; 3) produce maps showing surface water distribution and showing changes in surface water storage of individual lakes and over large areas. Lakes as small as seven acres can be measured from ERTS-1 data with less than 10 percent error; 4) conduct emergency remote sensing missions for assessment of damage from floods, tornadoes, hail, and other disasters; 5) define sources and dissemination of pollutants in our streams such as suspended sediment, algae, thermal pollution, feedlot runoff, and others; 6) provide rapid early detection of agricultural crop diseases and insect infestations, including Dutch Elm disease, corn fungus, root rot, grasshopper invasion, etc; 7) provide rapid and timely information for assessing certain hydrologic conditions on watersheds including soil

CONTACTS

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(continued)

South Dakota (continued)

moisture and potential drought conditions; 8) assist in evaluating the occurrence of useable ground water supplies; and 9) evaluate wildlife habitat conditions.

CONTACTS:

1. Victor Meyers, Director, Remote Sensing Institute, South Dakota State University, Brookings, South Dakota, (605) 688-4184.
2. Dan Bucks, Commissioner, State Planning Bureau, Pierre, South Dakota 57501, (605) 224-3661.
3. Jack Ullmon, Secretary, Dept. of Economic and Tourism Development, Office Building #2, Pierre, South Dakota 57501, (605) 224-3158.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Tennessee

COOPERATING ORGANIZATIONS

Governor's Office
(State Planning Office)

PROGRAM/STATUS/RESULTS

John Wilson, working out of the Governor's Office (State Planning Office), holds several offices including Chairmanship of the State Planning Commission. He is responsible for coordinating all remote sensing activities by state and local agencies. They have used ERTS data and NASA high altitude A/C imagery for some land-use planning and are very much interested in developing a state-wide operational system. Wilson believes in the ERTS program and is familiar with the land-use and other ERTS experiments conducted by the Univ. of Tenn., TVA, and E. Tenn. State Univ. They are also working with the Appalachian Regional Commission and the Ohio River Basin Commission on the cost effectiveness of using remote sensing in land-use and strip mine studies.

CONTACTS

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CONTACTS:

1. John Wilson, Governor's Office, State Planning Office, 506 State Office Building, Nashville, Tennessee 37219, (615) 741-1676.

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STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Texas

COOPERATING ORGANIZATIONS

General Land Office
Texas Water Development Board
Bureau of Economic Geology
NASA/JSC

State of Texas Remote Sensing
Task Force (Membership includes
the Governor's Office, 14 State
Agencies and 2 Texas Universities)
NASA/JSC/Regional Applications
Project.

PROGRAM/STATUS/RESULTS

State LANDSAT follow-on: Experiment to develop operational remote sensing techniques. The agencies listed above are those principally involved but others will participate. Plan to inventory the coastal wetlands and develop a quasi-operational monitoring system.

The LANDSAT study described above is principal development from this project but the Regional Applications Office at JSC continues to provide support to other organizations trying to develop applications in areas not covered by the LANDSAT contract.

CONTACTS

1, 2, 3, 4

4

CONTACTS:

1. Robert Armstrong, Commissioner, and Ronald Jones, State of Texas General Land Office, 201 East 12th Street, Austin 78705, (512) 475-2071.
2. David L. Ferguson, Texas Water Development Board, 301 West 2nd Street, Austin 70711.
3. E. G. Wermund, Bureau of Economic Geology, University of Texas, Austin 78712.
4. Gerald E. McKain, Regional Applications Office, Johnson Space Center, (713) 483-6287.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Utah

COOPERATING ORGANIZATIONS

Dept. of Natural Resources
Governor's Office
University of Utah
USDA/BLM

PROGRAM/STATUS/RESULTS

Task Force for Geodetic Control, Mapping, and Land Use Data Center: A number of fledgling remote sensing programs have never gotten off the ground because so much of Utah's senior officials time has been taken up with energy related matters. The remote sensing community in Utah is hopeful that this Task Force - made up of representatives from various agencies and with strong support from the Dept. of Natural Resources - may act as an integrating and unifying force. Few states have done as much in the way of preparing for an operational remote sensing system. Interagency coordinating committees, workshops, seminars and symposia have had support from the Governor but so far no really strong program has emerged. Changes in land-use legislation and budget allotments have been a major problem but the energy emergency and changes in the federal energy program planning process are probably the primary cause of lack of action by state officials. Dale Carpenter believes that this situation is changing and that this task force will produce some strong programs. Richard Turley, who is also Science Advisor to the Governor, also strongly supports the program. They want a digitized land-use and resource system and are seeking state funding.

State of Utah
U.S. Forest Service
University of Utah
U.S. Soil Conservation Service
Intermountain Forest & Range
Experiment Station
McDonnell Douglas Astronautics Co.

Cooperative Agreement for Large Area Thematic Map Generation of the Wasatch Front - The above agencies are undertaking a study to show the feasibility of producing accurate overlays to base maps at various scales using photographs, MSS (A/C and Space), and ground truth data. It was also expected that a valuable ecological test site and a trained team

CONTACTS

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1, 2, 3, 4,

Utah (continued)

of resource managers would be developed. Although map overlays and environmental impact information may have been developed, there have been serious administrative problems and the program appears to be dormant now.

State of Utah
Federation of Rocky Mountain States
University of Utah
Utah Power and Light Company
Mountain Fuel Supply Company
Mountain Bell Telephone Company

The Federation of Rocky Mountain States LANDSAT follow-on experiment. - Utah is one of the participating states in this six state land-use survey. In addition to the state the power and utility companies are putting up money and otherwise supporting this program. The University of Utah will do some image analysis but Colorado State University will have primary responsibility for analysis. State agencies will provide ground truth and make use of the products derived and will get some experience with a quasi-operational system but Utah at least is planning on a state-wide rather than a regional operational system. 5

CONTACTS:

1. Richard Turley, State Planning Coordinator to the Governor, State Capitol, Salt Lake City 84114, (801) 328-5111.
2. Merrill K. Ridd, Univ. of Utah, Dept. of Geography, Salt Lake City, (801) 581-8218.
3. M. R. Gibb, McDonnell Douglas Astronautics Co., Huntington Beach, Calif.
4. Robert W. Harris, Director, Intermountain Forest and Range Experiment Station, Ogden, Utah.
5. George Nez, Federation of Rocky Mountain States, Inc., 2480 West 26th Avenue, Denver, Colorado.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Vermont

COOPERATING ORGANIZATIONS

Water Resources Research Center

PROGRAM/STATUS/RESULTS

There is little activity and no state funding for any ERTS-derived programs. However Dr. Hugo John of the WRRC is attempting to get support from the Governor's office to support a regional approach in applying remote sensing through such organizations as the New England River Basins Commission. Vermont did receive a substantial out of court settlement from New York and the International Paper Co. when ERTS imagery showed serious pollution of Vermont waters by the latter company.

CONTACTS

1

CONTACTS:

1. Hugo John, Acting Director, Water Resources Research Center, University of Vermont, Burlington, (802) 656-4281.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Virginia

COOPERATING ORGANIZATIONS

Dept. of Administration, Division
of State Planning & Community
Affairs
(All State Agencies cooperating)

PROGRAM/STATUS/RESULTS

Many State employees and State agencies have cooperated with NASA and university investigators on a number of programs and LANDSAT derived products have probably been used rather extensively. However most of these efforts and contacts have been informal and structured state-wide participation has been minimal. On February 11, 1975 a meeting attended by representatives of concerned agencies was held under the Governors aegis where it was decided to develop a state-wide ERTS program. This is to be part of a larger land-use and policy planning program. Harold Jones will have primary administrative responsibility with a core staff in the Planning Office and will work closely with the Governor's cabinet. Jones is acquainted with the remote sensing community in Virginia, believes in the program, and expects to build upon the informal activities already underway. Many researchers in the academic community and in the Federal agencies however do not know him and have not been made aware of this program. Other leading members of this planning group are listed under contacts.

1, 2, 3, 4

University of Virginia

Robert Dolan has just commenced a LANDSAT analysis of Virginia's Shoreline. Apparently he has not had any formal contact with any State agencies but his work should be of interest to Harold Jones group (See Project 1 above).

7

Virginia (continued)

Old Dominion University
NASA/Wallops Island
NASA/Langley
USGS

Old Dominion University investigators have conducted a number of LANDSAT investigations and have been trying for some time to get the State and local agencies to use and follow up their findings. They have had some success but most of it has been through informal programs and person-to-person contact. Much of this has been in cooperation with R. L. Krieger of Wallops Island and with NASA/Langley. Hopefully a more structured state-wide applications program may grow out of their work through the efforts of the State Planning Agency. (See Project 1 above.)

5, 6

Virginia Institute of Marine Sciences
NASA

Virginia Institute of Marine Sciences has several contracts with NASA (Langley, Wallops Island, and Headquarters). One with the Office of University Affairs is for applying space technology to real world problems. They have been working with state and local agencies on such problems as the monitoring and control of aquatic plant life, oyster bed pollution, the measurement of circulation patterns on the continental shelf, and smoke plumes and particulate distribution.

5, 6

USGS/Reston
VA Div. of State Planning & Community Affairs

Kenneth McGinty has been responsible for the user evaluation module of U.S.G.S.'s CARETS regional survey and environmental impact experiment. He has maintained contact with user institutions throughout the investigation. Conferences, workshops, and questionnaire interviews were held to familiarize users with the range of products and services available, and to receive feedback on usefulness. The CARETS Information Center (CIC) provided free access to remote sensor data and project products. Lack of funding did not permit such services as imagery reproduction, search and retrieval assistance and imagery interpretation

8

(continued)

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Virginia (continued)

assistance as had been planned. Recommendations resulting from the evaluation reflect what they feel is the need to establish a flexible and reliable system for providing more detailed raw and processed land resource information as well as the need to improve the methods of making information available to users. In addition some users have asked the U.S.G.S. to devote more effort toward educating potential users in the use of new data products.

CONTACTS:

1. Harold Jones, Deputy Director, Dept. of State Planning and Community Affairs, 109 Governors St., Richmond, VA 23219, (804) 770-3784.
2. James Douglas, Commissioner, Marine Resources Commission, P.O. Box 756, 2401 West Avenue, Newport News, VA 23607, (804) 245-2811.
3. James Calver, State Geologist & Commissioner, Mineral Resources Commission, Charlottesville, VA.
4. Wiley Coster, Commissioner, Forestry Commission, Charlottesville, VA.
5. Earl C. Kindle, Old Dominion University, Norfolk, VA, (804) 489-6491.
6. R. L. Krieger, NASA/Wallops Island.
7. Robert Dolan, Brooks Hall, University of Virginia, Charlottesville, VA 22903, (804) 924-7951.
8. Kenneth McGinty, USGS, Reston, VA, (703) 860-7000.

7/10/75-rev.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES

STATE: Washington

COOPERATING ORGANIZATIONS

Pacific Northwest Regional
Commission (Washington, Oregon,
Idaho)
All State of Washington Agencies
(Dept. of Natural Resources -
lead agency)
USDI
NASA/Ames Research Center

PROGRAM/STATUS/RESULTS

Applications System Verification Test - Pacific Northwest Land Resources Inventory: This is a three year demonstration project to provide users from a variety of resource planning and management agencies within the three states with experience in extracting and using information derived primarily from LANDSAT MSS data but also from other sources. It is expected that upon completion of the project the necessary information for implementing an operational LANDSAT based Land Resource Inventory system will have been provided. Financial support for such an operational system would then be expected to come from solely within the three state region. This program is building upon experience gained in previous NASA and EROS supported programs.

CONTACTS

1, 2

CONTACTS:

1. Roger Harding, Dept. of Natural Resources, State of Washington, Olympia, Washington, 8-(206) 753-5338.
2. Robert Scott, Remote Sensing Coordinator, Dept. of Natural Resources, Olympia, Washington, 8-(206) 753-5000.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: West Virginia

COOPERATING ORGANIZATIONS

PROGRAM/STATUS/RESULTS

CONTACTS

Dept. of Natural Resources

Contribution of ERTS-B to Natural Resources Projection 1
and Recreational Development in West Virginia. Another
multidisciplinary proposal by Carl Bradford, Director of
Federal/State Relations for the Governor of West Virginia
(Ira Latimer, Co.I.) was not accepted.

Dept. of Natural Resources

State is looking to EPA for funding for a follow-on 2
study of Acid Mine Drainage. Many other state agencies
and the Appalachian Regional Commission were involved
in this study. While the Division of Reclamation is
most interested in pursuing the use of remote sensing
data in monitoring strip mining and land-use, they are
presently committing all available planning manpower
to preparing state regulations mandated by the forth-
coming strip mine bill.

CONTACTS:

1. Ira S. Latimer, Director, Dept. of Natural Resources, Charleston, West Virginia, (304) 348-2754.
2. William Raney, Administrative Assistant, Division of Reclamation, Dept. of Natural Resources,
Charleston, West Virginia, (304) 348-3267.

4/17/75

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE; Wisconsin

COOPERATING ORGANIZATIONS

State Planning Office
Dept. of Natural Resources
Univ. of Wisconsin/Madison

PROGRAM/STATUS/RESULTS

State-wide planning: The Planning Office has played a leading role in developing a state-wide remote sensing program. Its principle effort has been directed towards minimizing the duplication of effort by the user agencies and maximizing the utilization of available data through efficient management of data flow from acquisition to application. It expects to have a sophisticated state-wide remote sensing and data analysis center in operation within five years.

The DNR is the biggest user agency and is cooperating with the Planning Office in developing the state-wide operational system. Both agencies are supporting university studies and the DNR is providing A/C, and MSS and thermal scanners for use in such studies. The University researchers are working closely with the agencies and agency personnel frequently act as full members of the research team and even as P.T.'s. More specifically these agencies and the University have:

*Developed a state-wide land use classification system which will help provide a common language to encourage the sharing of data and reduce the need for duplicative inventories.

*Inventoried the amount of aerial photography being acquired by various state and local governments to ascertain if a standard set of periodic imagery will meet user needs.

*An information center and browse file used by the State agencies and general public which is maintained by the University's Environmental and Data Acquisition Group.

*Conducted training sessions and workshops in remote sensing with heavy emphasis on operational needs and user preparation.

CONTACTS

1, 2, 3, 4

(continued)

Wisconsin (continued)

*Compiled existing information to produce a state-wide perspective of resource distribution and utilization.

*Prepared a state-wide land cover map and others are in preparation.

*Computer classified the trophic status of all lakes over 20 acres (6,000 lakes). It is worth noting that DNR whose staff earlier had serious reservations about the applicability of satellite data is now preparing to use its own interactive terminal for monitoring lake eutrophic levels.

*Is now testing and refining a geographic information system - the U.S.G.S.'s Natural Resources Information System (NRIS) - which they expect to lead to a hybrid decentralized computer based system. This effort slowed considerably when funding from a National Land Use Act did not materialize.

CONTACTS:

1. Dale Marshall and Tom Krauskopf, Bureau of Planning & Budget, Dept. of Administration, Madison 53702, (608) 266-3382.
2. Pat Schraufnage, Head, Environmental Monitoring, Dept. of Natural Resources, Madison 53702, (608) 266-3291.
3. James Clapp, Dept. of Geography, Univ. of Wisconsin, Madison 53702, (608) 262-1978.
4. James W. Jondrow, Program Coordinator, Institute for Environmental Studies, Univ. of Wisconsin, WARF Bldg., 610 Walnut, Madison 53706.

7/11/75-rev.

STATE GOVERNMENT REMOTE SENSING ACTIVITIES
STATE: Wyoming

COOPERATING ORGANIZATIONS

Dept. of Economic Development
and Planning
Wyoming Geological Survey
University of Wyoming

PROGRAM/STATUS/RESULTS

The most direct involvement of Wyoming in NASA's Earth Resources program is through the LANDSAT follow-on experiment being conducted by the Federation of Rocky Mountain States. Wyoming agencies will provide ground truth and will use the maps and other products produced. Senior planning officials who have worked with University of Wyoming ERTS investigators and who have discussed the possible development of a basic land-use information bank with Nicholas Short and Harold Mathews of NASA have left office. William Smiley and Robert Houston may be the best links between the old and new administrations. The new administration may not be aware that it took five years to map 10-15% of the known structural features in the Wind River Mountain Range of Wyoming but that the remaining 85-90% were mapped in three hours from one LANDSAT frame.

CONTACTS

1, 2, 3

CONTACTS:

1. William Smiley, Dept. of Economic Planning and Development, State of Wyoming, Cheyenne 82001, (307) 777-7284.
2. Michael York, Dept. of Economic Planning and Development, State of Wyoming, Cheyenne 82001, (307) 777-7284.
3. Robert S. Houston, University of Wyoming, Laramie, (307) 766-1121.

4/17/75

AMBIONICS, INCORPORATED

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Attachment II

SURVEY OF STATE AND
SIGNIFICANT METROPOLITAN
LAND USE AND/OR NATURAL
RESOURCES INVENTORY AND
MONITORING INFORMATION SYSTEMS

William Bailey

William Bailey
Research Director

Elliott DeGraff

Elliott DeGraff
President

Prepared under Contract NASW-2756

November 12, 1975

ALABAMA

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS GUARANTEED

Summary of State Role

The Alabama Geological Survey has been working with NASA/MSFC on LANDSAT applications. The Survey produced a number of maps using LANDSAT imagery including a mosaic of the State and prepared a preliminary design for a State and regional oriented earth resources data and information system. A Governor's Committee for Remote Sensing Applications with representatives from key State agencies and MSFC was set up to help develop this concept but beyond a meeting apparently nothing has been done to implement this concept.

Alabama has had disputes with the Corps of Engineers on shoreline measurements (basis for allocation of some Federal funding). Daniel Sapp of the Alabama Geological Survey is advocating the use of a computer based system which could examine satellite imagery pixel by pixel and provide direct conversion from imagery to computer eliminating the map stage.

Apparently none of the regional commissions or cities are doing anything especially noteworthy with geobased information systems. The City of Birmingham recently purchased a new IBM 370/125 (They formerly leased computer time.). The City's Planning Service Division has been examining geobased information systems and had tentative plans for developing one of their own. However, the election of a new mayor this week (Nov. 9, 1975) will probably require reexamination of all plans.

The Bureau of Census DIME files are being used by a number of Alabama cities and regional councils (e.g., the Birmingham-Jefferson County Regional Commission), but merely for routine operations.

The Top of Alabama Council of Government and city of Huntsville officials have attended seminars and talked to officials at NASA/MSFC, and may have some programs under consideration.

To sum up: Both State and metropolitan officials have looked into the possibilities inherent in the marriage remote sensing and computer technology and have been talking to NASA officials but, aside from the mapping efforts of the Alabama Geological Survey, little has been done in concrete terms.

Alabama (continued)

CONTACTS:

1. Phillip E. LaMoreaux, State Geologist, Alabama Geological Survey, University, Alabama 35486, (205) 759-5721.
2. R. C. "Red" Bamberg, Director, Alabama Development Office, State Office Building, Montgomery, Alabama 35486, (205) 269-1831.
3. Edward Hudspeth, Staff Director, Energy Management Board, State Office Building, Montgomery, Alabama 35486, (205) 269-1831.
4. Thomas Wilkins, Planning Services Division, Community Development Dept., Rm. 1000, City Hall, Birmingham, Alabama, (205) 254-2720.

ALASKA

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

Summary of State Role

To quote from an earlier report (Ambionics - Users Reference Manual) "The "last frontier" nature of the state of Alaska has always encouraged close and effective coordination and cooperation between the University and State, federal and industrial agencies. In particular many of the University's numerous field stations throughout the state are located within or near facilities of other agencies which provide them with some essential logistic support. Conversely a large and increasing number of state and federal agencies are locating their research divisions on the University's campuses".

Probably no state has made more productive use of LANDSAT and other remote sensing products than Alaska. However practically all remote sensing activities - even operational - have been done in cooperation with various Federal agencies and the University of Alaska and we at Ambionics strongly recommend that all NASA program activities be coordinated with other Federal agencies who are already playing an important role in Alaska. This also applies to the metropolitan governments of Alaska.

No direct contact was made by Ambionics investigators with any of the city authorities in Alaska. However representatives from Alaska's major cities have attended symposia and seminars conducted by U.S.G.S. and the University of Alaska where presentations were made on both geobased information systems and remote sensing. Although some of the attendees indicated they were using computerized geobased information system, they apparently were not very sophisticated systems. Most or all appeared impressed by the potential of the new technologies.

It should be noted that the State Capital is being transferred from Juneau to Anchorage and the move may be accompanied by the introduction of new techniques by the State agencies.

The Geophysical Institute of the University of Alaska has an extensive browse file and computer facilities that are being used by both State and Federal agencies.

Every remote sensing applications oriented Federal agency from the Bureau of Land Management to the U.S. Coast Guard has been working with the State agencies on problems ranging from the monitoring of ice movements to the mapping of the Indian lands. For example: The Mineral Industry Research Laboratory in cooperation with various State agencies is making extensive use of the Mineral Resources

Alaska (continued)

Computer File developed by the U.S.G.S. The geological data, and its ready accessibility, is being used in a wide variety of activities (construction, site selection, comprehensive planning, etc.) besides its primary use in mineral exploration and mining activities.

Alaska abounds in similar "for instances" but the best source of detailed operational information are the Federal-State Land Use Planning Commission, the Federal agencies, and the University of Alaska.

CONTACTS:

1. Larry Oullette, Resource Planning Team Leader, Federal-State Land Use Planning, 730 West Fourth Street, Alaska 99501.
2. John M. Miller, Head of Science Services, Geological Institute, Univ. of Alaska, Fairbanks, (907) 479-7291.
3. Albert E. Belon, LANDSAT Project Coordinator, Geological Institute, University of Alaska, Fairbanks, (907) 479-7516.
4. Ross Schaff, Geologist, Dept. of Natural Resources, 301 Porcupine Drive, Anchorage 99504, (907) 279-1433.
5. Robert Weeden, Director, Policy Development and Planning, Office of the Governor, Pouch A D, Juneau 99801, (907) 465-3512.
6. Paul Metz, State Geologist, Mineral Industry Research Laboratory, Box 95303, Univ. of Alaska 99701, (907) 479-7135.

ARIZONA

Summary of State Role

The major program in Arizona is the Arizona Land Use Experiment (ALUE) now being conducted jointly by the state, NASA, and the Interior Department. State management is by the Arizona Resources Information System (ARIS) under Carl Winikka with major federal involvement managed by Herbert Schumann of the USGS. At present, the entire state is being mapped in 1900 1:24,000 orthophotoquads in addition to 1:1,000,000 and 1:500,000 maps based on LANDSAT imagery. Early goals of ALUE are the "acquisition of base aerial photography of Arizona, the production of orthophotoquads at a scale of 1:24,000, the development of a land-use/land-cover classification system compatible with the system being developed by the Department of the Interior, the selection of a series of map scales needed to display base information, the provision for training in utilization of remote-sensing techniques for operational personnel, and the application of remote-sensor data to land- and resource-management problems."¹

User access to ALUE data as well as interpretation equipment is available at the ARIS project office and at the DOI EROS Application Assistance Facility (AAF) in Phoenix.

Data from ARIS is now being used operationally by several state, federal, local, and commercial agencies, including the Arizona Dept. of Transportation, the Arizona Oil and Gas Conservation Commission, the Arizona Water Commission, the Arizona Dept. of Public Safety, the Maricopa County Attorney's Office, Federal Highway Administration, U.S. Soil Conservation Service, the USGS, the USBLM, USBIA, U.S. Bureau of Reclamation, public utility companies and mining and petroleum companies.

CONTACTS:

1. Carl C. Winikka, Director, Arizona Resources Information System, 350 N. Central Avenue, Phoenix, Arizona 85012, (602) 271-4061.
2. Herbert H. Schumann, 5017 Federal Building, 230 N. First Avenue, Phoenix, Arizona 85025, (602) 261-3188.

¹Winikka, Carl C., and Schumann, Herbert H. "Arizona Land Use Experiment." Proceedings, NASA Earth Resources Survey Symposium. Houston, June 8-13, 1975.

ARKANSAS

Summary of State Role

No statewide land use inventory system.

There is a LANDSAT follow-on experiment at the University of Arkansas but it is not in operational use.

There used to be a comprehensive state planning agency but it was dissolved by the last legislature.

CONTACT:

1. True Holbrook, Acting Director, State Geological Commission, Little Rock, Arkansas 72201,
(501) 371-1616.

CALIFORNIA

Summary of State Role

The Office of Planning and Research has the responsibility for coordinating state land use information programs. This office is relatively new and its operations are still in the formative stage. They do have a small data system initially developed as a filtering screen for EIS reports. The cell for this system is the USGS 7 1/2' quad. The office is now organizing sessions with the several state agencies to determine the various data needs. Several of these agencies now have their own information systems to serve their individual needs. For instance, the Department of Water Resources has a major data file as does the Coastal Commission, the Water Resources Control Board, and the Division of Mines and Geology of the Department of Conservation.

In addition, several metropolitan areas, cities and counties have highly sophisticated geobased land use information systems.

Los Angeles

The city of Los Angeles is instituting the LUMIS system developed in cooperation with JPL. LUMIS is an interactive graphic display information system to permit users interrogation and display of land use and population statistics by Census tract and block. In addition, a Multiple Input Land Use System (MILUS) is being developed which will allow the construction of geocoded data files from several sources including aerial and satellite imagery.

Santa Clara County

The Center for Urban Analysis, attached to the Office of the County Executive has an extensive geobased information system based on DIME files which provides a resource and a problem-solving tool for a broad range of county responsibilities. A key to the success of this system has been the direct participation of the user agencies in data collection, file maintenance and operation. Representative projects completed include:

- o San Jose Police Department Beat Development
- o Mt. Pleasant School District Grade Reorganization and Boundaries
- o Morgan Hill School District School Bus Scheduling
- o San Jose Fire Department Analysis
- o Computer Assisted Public Safety System (Dispatch)

California (continued)

CONTACTS:

1. William Press, State of California, Office of Planning and Research, Sacramento, California, (916) 322-2318.
2. Glenn Sawyer, Dept. of Water Resources, Sacramento, California, (916) 445-6746.
3. Jack Shoup, California Coastal Commission, San Francisco, California, (415) 597-1001.
4. Thomas Gay, Dept. of Conservation, Division of Mines and Geology, Sacramento, California, (916) 445-1825.
5. Albert J. Landini, Dept. of City Planning, City Hall, Los Angeles, California, (213) 485-5056.
6. Frank M. Lockfeld, Director, Santa Clara County for Urban Analysis, San Jose, California, (408) 299-1121.

COLORADO

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

Summary of State Role

Colorado at present has no statewide land use information system. However, two key state programs are now developing key data which would be used in any future system. The first of these is the identification of areas and activities of state interest under House Bill 1041, enacted in 1974. Under this bill state funding is provided to local governmental planning bodies to designate such areas of state interest as key facilities (e.g. airports, highway interchange, public utilities), natural hazard areas, mineral resources areas and natural resources of statewide importance. These "1041 reports" are now being prepared. The State Land Use Commission is managing this program and is developing guidelines for the management of these identified areas. The authority for implementing these guidelines is at the local level.

The second major statewide program is a complete mapping of the entire state under the state cartographer, Lou Campbell. In this \$3 million program, the entire state is being flown at 40,000 ft., and 1:24,000 photoquad maps prepared. In addition, certain communities are being mapped at a scale of 1:2400. Combined with the "1041" program, this should provide the data needed for a state-wide land use information system if and when one becomes operational.

Jefferson County, just west of Denver, is the fastest growing county in the state with all the potential problems such growth can bring. Fortunately, an active, aggressive county planning department provides up to date land use classification and planning services at a budget of \$100,000/year. They use the cellular system, CMS II, developed by George Nez, now with the Federation of Rocky Mountain States, and have mapped twenty attributes for the mountain area of the county. They are now expanding this to the plains area. They have just transferred to an in-house Honeywell 6620 computer and are looking into various polygonal system is needed for specific application. The present system has been used in generating the state required "1041" reports.

CONTACTS:

1. Phil Savage, Executive Director, Colorado Land Use Commission, Rm. 600, Columbine Bldg., 1845 Sherman St., Denver, Colorado 80203, (303) 892-2773.
2. Lou Campbell, State Cartographer, Div. of Planning, Dept. of Local Affairs, Rm. 615, Columbine Bldg., 1845 Sherman St., Denver, Colorado 80203, (303) 892-2351.
3. George Nez, Federation of Rocky Mountain States, Suite 300-B, 2480 W. 26th Ave., Denver, 80211, (303) 458-8000.

Colorado (continued)

4. Keith Turner, Jefferson County Planning Department, County Building, Golden, Colorado, (303) 279-6511, ext. 305.
5. Paul Gesso, Jeferson County Planning Department, County Building, Golden, Colorado, (303) 279-6511, ext. 305.

CONNECTICUT

Summary of State Role

Connecticut introduced a statewide land use information system in 1970. It is based on grid cells of 300 x 300 ft. and 58 categories which are compatible with the USGS/LUDA system. It was developed by the Dept. of Transportation and uses that departments Univac 1106 but the biggest users are the Department of Energy and Planning and the fifteen sub-state Regional Planning Agencies. All of the programs are written in Fortran V.

The basic input to the system was an aerial survey taken in 1970 and updated in 1975. The images were not rectified and boundaries were resolved by free hand drawing on overlays over USGS quadrangle sheets.

The Quadrangle overlays were digitized on a Computer Industries, Inc. LARR-V (Large Area Digitizing System).

The small grid size permits ready editing and retrieval in polygon format. In use the grid size for analysis (300' x 300' or larger) is selected by the user and grids may be assigned up to 72 bits of identification. Each grid is assigned a traffic zone, town number, census number and land use category. These grids are outputted for further analysis, tabulation or plotting. Tabulations of data by analysis district and printer plots of grid cells are the prime outputs. Line plots are possible but time consuming. Because of the small size (approximately 2 acre) of the allowable grid cell, very detailed area plots may be prepared or cells may be aggregated into larger groupings.

They hope to improve their system prior to 1980 in order to take advantage of 1980 census data. However money is very tight.

Land use legislation and regulation is essentially a local affair in Connecticut. The State does not have a single land use planning department but the Dept. of Transportation, Dept. of Energy and Planning, Dept. of Commerce, and the University of Connecticut share responsibility and work with local authorities. Local authorities depend largely upon low level aerial surveys when current data is needed.

Connecticut (continued)

There is considerable pressure to update the maps and data files at both state and local levels. The Bureau of the Census is encouraging the development of geographic base files and systems compatible with its GBF/DIME (Geographic Base File/Dual Independent Map Encoding) system. Many counties and regional organizations, as well as the Dept. of Energy and Planning are cooperating in this venture. While some of the counties and regional organizations have sophisticated equipment available to them it is unlikely that any new developments of interest to NASA will be started here by local or state authorities in the near future.

CONTACTS:

1. William H. Messner, Planner, Dept. of Transportation, 17 Van Dyke Avenue, Hartford, Connecticut, (203) 566-4211.
2. David Harrigan, Director, Dept. of Energy and Planning, (203) 566-2046.
3. Barry Budlong, Director, Dept. of Intergovernmental Relations, (203) 566-2836.
4. Harold Ames, Dept. of Energy and Planning, (203) 566-3410.
5. David Lindgren, Dept. of Geography, Dartmouth College, Hanover, New Hampshire 03755, (603) 646-1110.
6. Robert B. Simpson, Dept. of Geography, Dartmouth College, Hanover, New Hampshire 03755, (603) 646-1110.

DELAWARE

Summary of State Role

Delaware's Dept. of Natural Resources has participated in and has used products of the CARETS experiments. The Office of Planning is now cautiously examining the possibilities inherent in geographical information and data management systems. They are encouraging and closely following the development of a geo-based Data Management System in New Castle County (described below) which may become the basis for a statewide land use planning system.

Cooperating Organizations

New Castle County
Areawide Waste Treatment
Management Program (AWTMP)

Office of Planning, Executive
Dept.
Wilmington Planning Dept.
and other city agencies
Newark Planning Dept. and
other city agencies

Environmental Systems Research
Institute (ESRI)

The AWTMP is the NEPA, Section 208 agency for New Castle and the cities of Wilmington and Newark and as such is responsible for the waste treatment and environmental management planning for this heavily industrialized area. They are now just going on line with the NCC-208 (New Castle County - 208) system similar to Maryland's MAGI geo-based land use system. The NCC-208 was designed primarily for updating and maintaining the existing county and city comprehensive land use plans and to meet the requirements mandated by Section 208. It was constructed by Environmental Systems Research Institute of Redlands, California and stores spatial data covering 24 sets of physical, social, and economic variables in computer format. It uses 500 cells corresponding to a 20 x 20 cell breakdown of the 10,000 ft. state plane coordinate grid lines. The system can be used to summarize data by geographic area, retrieve point and area information, and perform search radius analysis, overlay analysis, modeling, and river segment simulation.

The County's IBM 360/40 computer in Wilmington is being used but, because of limitations in its memory and limited accessibility they are depending primarily on a Burrough's 6700 at the University of Delaware at Newark. In addition they still use ESRI as a consultant and can use ESRI's interactive system.

Delaware (continued)

Land use classification is based on the U.S.G.S. Classification Scheme for Remotely Sensed Data. Land capability models are being developed which deal with economic, protective, and ecological functions of the land.

All of the original data inputs were provided by the county mostly in the form of base and thematic maps. The State Highway Dept.'s map series (1:63,000 scale) provide the base map. Data varied considerably in quality and age, with incompatible scales and drafted on different base maps. All this data was referenced to the state's Coordinate Grid System and merged in a digitizing and data processing procedure. This approach obviously created many problems but resulted in major budget and time savings. Dr. Goehring feels that he obtained a working system in a relatively short period of time. While the input data was relatively crude it meets most of their needs and can be improved over time. They are currently refining their data and debugging the system.

The State Planning Office is following developments in New Castle and is reexamining its own position on land use planning and regulation. There appears to be general respect for the work AWTMP is doing but also some feeling that perhaps they committed themselves too early to a specific EDP system.

<u>Metro./Regional Info. Systems/Status</u>	<u>Handling/Storage Procedures</u>	<u>Data Sources</u>	<u>Products Produced</u>	<u>Comments</u>
NCC-208 (See New Castle County Report). Working system but many problems in refining data inputs.	Burrough's 6700 Computer & IBM 360/40 - 500 ft. grid mode.	County files, base & thematic maps which are digitized & merged.	Land use & base & thematic suitability maps.	System not highly dependent on very accurate data.

CS

Delaware (continued)

CONTACTS:

1. David R. Keifer, Director, Office of Planning, Executive Dept., Legislative Hall, Dover, Delaware 19901, (302) 678-4114.
2. Benjamin Coston, Office of Planning, Executive Dept., Legislative Hall, Dover, Delaware 19901, (302) 678-4114.
3. Darrell R. Goehring, Senior Planner, New Castle County Areawide Waste Treatment Management Program, No. One Peddler's Row, Peddler's Village, Newark, Delaware 19702, (302) 731-7670.
4. Jack Dangermond, Environmental Systems Research Institute, Redlands, California, (714) 793-2853.

FLORIDA

Summary of State Role

The State of Florida was the first to enact land use legislation based on the American Law Institute model. Baseline data on current land use have been established. Aerial photography was used to generate this information. The U.S. Geological Survey is in the process of putting Florida land use data into computer storage. The resulting files will be available to regional groups. The grid will cover areas as small as 40 acres, and is therefore not to be expected to be useful for urban applications.

The Brevard County Development Administration has served as a lead agency in applying remote sensing information to regional planning in east central Florida. Land use maps of Brevard County have been prepared on a parcel by parcel basis. There, and similar mapping of Orange County (which included the city of Orlando) are currently being prepared for computer storage.

The Florida Dept. of Transportation maintains a depository for remote sensing, including LANDSAT imagery. The latter has been used to map the April 1972 Suwanee River flood, as well as for geological formation mapping.

Mapping of the cities of Miami and Tallahassee have been digitized for computer usage. The maps are developed as GBF/DIME files for each of the two cities. Applications in Miami include reprecincting and redistricting to accommodate population distribution changes, and study of crime activity distribution to permit more efficient and timely police patrols. Applications in Tallahassee include refuse vehicle routing, carpool formation, and development of a profile for utility customer movement.

CONTACTS:

1. Dr. Garland Thomas, Brevard County Planning Department, Titusville, Florida, (305) 267-9411.
2. Mr. R. G. Whittle, Jr., Director, State Planning Office, Tallahassee, Florida, (904) 488-1115.
3. Mr. Joseph Malone, Management Information System Section, Community Improvement Program, 2200 Courthouse, Miami, Florida, (305) 377-5201.
4. Ms. Barbara Anderson, Tallahassee-Leon County Planning Dept., P.O. Box 533, Tallahassee, Florida, (904) 488-6133.

GEORGIA

Summary of State Role

Land use mapping is being evaluated for the State by the State Department of Natural Resources, Office of Planning and Research. Using LANDSAT imagery, an analysis was performed to identify land use by comparison of the four channel signals. The program developed for this is termed ASTEP (Algorithm Simulation Test and Evaluation Program); the computer used is a Univac 1108.

OPR is also active in other uses of LANDSAT imagery. A new island was discovered off the Georgia coast in this way, growing to three miles long over the past sixteen years. The OPR has a contract with the Astrogeology Center of the U.S. Geological Survey, at Flagstaff, Arizona, to provide interpretation and analysis for computer enhancement of LANDSAT imagery. In connection with this work, Georgia geologic faults are being mapped and studied. An example of this is the Brevard fault near Atlanta. A system of shattering faults, younger than Brevard, was found on its northwest side, near an Atlantic industrial park. The industrial park is at present short of water supply, using a river which is inadequate for this purpose. The shatter zone provides a geological clue to locate alternate sources of ground water. An obvious land use implication of this work is that the mapping of faults permits evaluation of the suitability of sites for industrial development and, in particular, for the siting of power plants.

A mapping was carried out using LANDSAT imagery in 1973 by the Dept. of Natural Resources on a scale 1:250,000, showing every body of water five acres or greater in Georgia. This work was prompted by the Dam Safety Act of 1972. Results were turned over to the Atlantic District of the U.S. Corps of Engineers, and consisted of a digital listing of ponds, locations, descriptions, and ownership. The listing has been also very useful to the Fisheries Management.

About 20,000 square miles, roughly a third of the state, is being mapped using standard altitude black and white photography. This mapping will be analyzed in four acre grids for land use, using the Anderson categories, as part of the national program of the U.S. Geologic Survey.

CONTACTS:

1. Sam Pickering, Director, Earth and Water Division, Dept. of Natural Resources, 19 Hunter St., S.W., Atlanta, Georgia 30334, (404) 656-3214.

HAWAII

Summary of State Role

The state of Hawaii has pioneered in land use legislation but its public record system is presently very primitive. It is also suffering from a burgeoning population, limited resources, and attendant environmental problems. The island and county of Hawaii does have a geobased information system built upon existing tax maps. Tax map keys, and census tract and block numbers are used as parcel identifiers. It apparently (detailed information not available at this time) serves as an information source but is not linked directly to the user departments. It is oriented to land use inventory, including demographic, economic and ownership data.

Honolulu and the other cities and islands (counties) of the State may have geobased information systems but if so they are not very effective.

H. W. Systems, Inc. of Van Nuys, California, has installed several computerized land record systems. (TELECADESTRE is H. W. Systems designation.) for little companies in Hawaii. TELECADESTRE customers buy computer time from service companies and use H. W. software.

CONTACTS:

1. Hideto Kono, Director, Dept. of Planning and Economic Development, 250 S. King St., Honolulu, Hawaii 96813, (808) 548-6914.
2. Stanton H. Wong, President, H. W. Systems, Inc. 6950 Valjean Avenue, Van Nuys, California, (213) 988-1830.
3. Nancy Fowler, Coordinator, Urban Planning Information Center, Dept. of Planning & Economic Development, P.O. Box 2359, Honolulu 96804, (808) 538-3068.

IDAHO

Summary of State Role

Little activity in geographical information systems exists on the local level in Idaho, presumably because the State participates with Washington and Oregon in the work of the Pacific-Northwest Regional Commission. By mid-November, this project will result in completion of mapping on scales 1:250,000; 1:500,000; and 1:1 million. The mapping will be digitized for computer input and digital analysis. The latter is to be done as Phase 3 of the project, at Ames Research Center and at Sioux Falls.

CONTACTS:

1. Wally Hedrick, Planner for Information Systems, State Planning & Community Affairs Agency, State of Idaho, Boise, Idaho, (208) 964-3275.

ILLINOIS

Summary of State Role

The State of Illinois has participated, through its various organizations, in several programs for specific users of LANDSAT imagery, such as crop identification, environmental consideration in dam construction, urban and regional change monitoring, air quality, and corn blight monitoring. The Center for Advanced Computation (CAC) of the University of Illinois at Urbana has developed software for interpretation of multispectral imagery on the ILLIAC IV.

The Northeastern Illinois Planning Commission has cognizance in land planning over a six county area around Chicago. The Commission has provided \$60,000 to the CAC group to do land use analysis, based on LANDSAT imagery, for the six counties. Program manager at CAC is Robert M. Ray. Plans are to use 16 categories in the identification. The Commission has an annual budget around \$100,000, plus some 208 funds from the Environmental Protection Agency to do water quality management studies. An IBM 370-158 is used.

The City of Chicago uses a GBF/DIME file in its city planning and police work. This file is based on Cook County taxing information and current maps of the city; there is no program of aerial photography. The city uses an IBM 155 and a Calcomp plotter.

CONTACTS:

1. Robert M. Ray, Center for Advanced Computation, University of Illinois at Urbana, Urbana, Illinois 61801, (217) 333-2228.
2. Ingeborg Hutzel, Northeastern Illinois Planning Commission, 10 South Riverside Plaza, Chicago, Illinois 60606, (312) 454-0400.
3. Robert Jirout, Director, Data Center, Chicago Civic Center, Room CL 27, Chicago, Illinois 60602, (312) 744-8161.

INDIANA

Summary of State Role

Indiana has no existing or proposed land use legislation, but land use mapping for special purposes is being carried out in selected areas of the state. A statewide land use inventory is being started as part of the HUD 701 program, using USGS classification and aerial photography. Indiana State University will aid the State Div. of Planning and Research in this effort. Work on coastal zone management is also being started. A statewide mapping is being carried out for the Soil Conservation Service and the soil survey is planned for completion in ten years. The Laboratory for the Application of Remote Sensing (LARS) at Purdue University is supporting this program with LANDSAT imagery.

LARS is also building a localized data base for the Yorktown area, with support from Yorktown and the Indiana Heartlands Coordinating Commission. The data base will include inputs from 208 funded projects.

LARS is involved in several other studies with a land use implication. Studying the use of remote sensing for the Indiana Highway Department, the Laboratory is looking for potential applications in locating gravel deposits, pinnacle reefs of limestone deposits, and routing of new highways. The Laboratory has demonstrated strip mine mapping for the Bureau of Reclamation and is doing surface mapping of water bodies for the U.S. Environmental Protection Agency. For EPA, a land use inventory known as the Great Lakes Land Use Inventory, covering an area of 85 million acres using a 5 acre grid has recently been completed with LANDSAT imagery. Level 1 and level 2 categories of land use are included in the mapping, and a color coded map of scale 1:238,000 has been prepared. The area covered includes 13 Indiana counties, and this portion is of interest for possible application by the Indiana Planning Department. Report of this work is in preparation.

The Indiana Heartlands Coordinating Commission has also been recently provided by LARS with a land use map of eight counties in central Indiana, around Indianapolis.

CONTACTS:

1. Frank Kirschner, Director, LARS/Purdue, West Lafayette, Indiana, (317) 749-2052.
2. Theodore Pantazis, Director, Div. of Planning and Research, Dept. of Commerce, Indianapolis 46204, (317) 633-4346.

IOWA

REPRODUCTION OF THE
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Summary of State Role

The State of Iowa and intrastate organizations have been exceptionally active in exploring the uses of remote sensing and in developing technology for land use management. The former of these activities is spearheaded by the Iowa Geological Survey and the University of Iowa. Activity in the latter area is lead by the University and the state's major urban area, Des Moines.

The Remote Sensing Laboratory of the Iowa Geological Survey, which has compiled an index of Iowa imagery, has been designated the clearing house for state remote sensing acquisition, data analysis, and maintenance of the index. Under an EROS grant, the laboratory has completed an atlas of land and water planning maps for an eleven county area in south-central Iowa. The maps are based on LANDSAT and Skylab data as well as aerial photography.

The Institute of Urban and Regional Research, of the University of Iowa, has completed a land resource information project for the State of Iowa Office for Planning and Programming. For this project, the computer package Planning Land Use System (PLUS) was adapted to State data and the system is currently operational.

The Land Use Analysis Laboratory, also of the University of Iowa, performs research in land use planning and management. Some recent products include "A Preliminary Resource Assessment," a report on land use for the East Central Intergovernmental Association, and a report analyzing the natural resources of Story County.

Land-use applications of the work described above are generally oriented to regional problems and resource management. For urban applications, finer details must be overlaid onto these products. Des Moines is engaged in the "Des Moines Project," an effort to use geographic base file technology in a data management system. The prototype system uses an IBM 360 with 120,000 bytes storage. Base mapping was accomplished by aerial photography. With an overlaid grid system, the mapping was integrated into a geographic subsystem and a formatted file system to form the prototype data management system. Potential applications include location of existing facilities, gas and water connections, electric transmission, mapping of soils and vegetation, property mapping, zoning, analysis of land use, and analysis of municipal service requirements.

Iowa (continued)

CONTACTS:

1. Jon Prunty, Geoplanning Program Director, Armory Building, E. 1st and Des Moines Street, Des Moines, Iowa 50307, (515) 283-4060.

KANSAS

Summary of State Role

Land use mapping techniques were developed by the Kansas University Space Technology Center, and initially applied to inventories of Finney County and the Pawnee River Basin, adjacent areas in western Kansas. Next, a land use map at a scale of 1:1,000,000 was prepared of the entire state of Kansas, with 12 categories of land use. The same techniques were applied to development of land use data for the Four Rivers Resource Conservation and Development District, with jurisdiction over eight north-central Kansas counties. The data used in this program were primarily derived from LANDSAT imagery, with some U2 and some low altitude photography. Interpretation was aided by the State Geological Survey and the Department of Economic Development. The latter has used these data in preparing large scale urban land use maps for Cherokee County in the southeast corner of the State, and the towns of Galena and Baxter Springs.

Land use maps were also prepared for the Mid America Regional Council, of an eight county area (three in Kansas and eight in Missouri) to measure urban change. Photography from flights in 1969 and 1974 was compared to assess the directions of urban growth and the loss of prime agricultural land. The maps are currently in use for policy decisions, such as the division of census tracts.

Using U2 photography, the Center mapped Kansas City, Kansas. This allowed the city to be divided into equal regions of a size compatible with the capabilities of existing contractors for waste disposal. A considerable savings was obtained over the original approach of using one major contractor for the entire city waste disposal.

The Space Technology Center relies on visual analysis, and does not use computers for analysis of data. Automatic updating of land use records directly from digital tape for LANDSAT imagery has been demonstrated by the Department of Economic Development. Although this mechanical approach is more costly at present than visual analysis, it is expected to become practical in a few years.

Funding of the Center is about \$150,000 per year in the Applications Laboratory, which is primarily interested in practical use of remote sensing for land use inventory and management, and about \$400,000 per year in the Remote Sensing Laboratory, which is primarily interested in development.

Kansas (continued)

CONTACTS:

1. Dr. B. G. Barr, Director, University of Kansas Space Technology Center, Lawrence, Kansas 66045, (913) 864-4775.
2. Dr. Louis Dellwig, Director, Remote Sensing Laboratory, Lawrence, Kansas 66045, (913) 864-4832.

KENTUCKY

Summary of State Role

The State (Office of Planning Research, Dept. of Natural Resources and Environmental Protection) is conducting a LANDSAT follow-on study on the feasibility and cost-effectiveness of using satellite imagery to inspect and monitor surface mining operations. Although they are not happy with the resolution they are presently gathering they do feel that satellite imagery will be a useful operational tool in five years. Currently neither the State nor any of its cities or urban regions appear to be developing or even contemplating any geobased information systems of any significance.

The Soil Conservation Service has LANDSAT imagery to map Jefferson County and other sections of Kentucky and USGS and the Corps of Engineers have conducted LANDSAT based studies which may have provided data for computerized information systems but the State only participated by providing some ground truth.

CONTACTS:

1. B. F. Fish, Research Coordinator, Office of Planning and Research, Dept. of Natural Resources and Environmental Protection, Frankfort, Ky. 40601, (502) 564-7320.

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LOUISIANA

Summary of State Role

The State Planning Office of Louisiana uses the USGS Mapping and Land Use Classification System on a parish by parish basis (LUDIS). Various local and regional groups use other geographic systems. These include the Rapides Parish Planning Commission, with mapping based on NASA aerial photography. The city of New Orleans has its own system, and is assisted by Bill Smollin of NASA in land use identification and classification.

The State Planning Office has digitized the New Orleans traffic zone map, cross matched it with demographic data, and has what appears to be the beginnings of a useful geocode for management information. State funds (about \$5,000 from the State Planning Office plus about \$10,000 of labor donated by others, notably the University of New Orleans) supported this work. The system is operational on the UNIVAC 1108 at NASA-Slidell, and is adaptable to NOVA minicomputers. The Department of Corrections plans to display crime data with this system. Baton Rouge, which needs to update its census procedures, plans to do similar work.

CONTACTS:

1. Charles D'Agostino, Manager, Tech. Transfer Office, (601) 688-4322.
2. Bill Smollin, NASA-Huntsville, (504) 523-1432.
3. Dr. Gordon Saussy, New Orleans Traffic Dept., (504) 288-3161, ext. 248.

MAINE

Summary of State Role

Maine is divided into eight regional planning districts based on the eight major drainage basins in Maine. None of the State agencies or regional planning districts have, or are planning for, a geographical based information system of any consequence. They are, however, cooperating with various Federal agencies in some remote sensing studies.

Portland, Bangor and perhaps other localities do have computerized management information systems and are working with Bureau of Census DIME files but remote sensing will not play a significant role. (See Massachusetts report for possible regional approach.)

MARYLAND

Summary of State Role

The Maryland State Government play a leading role in land use planning. The Comprehensive State Planning Division of the Department of State Planning has developed the Maryland Generalized Land Use Plan (MGLUP). The Maryland Automated Geographic Information System (MAGI) is the statewide planning information system which supports MGLUP and other planning activities.

Some Maryland counties and local jurisdictions, e.g., Washington Council of Governments, Baltimore, Prince George's and Montgomery, have computer facilities and geobased files available to them and have been following the development of MAGI. They do have geobased files and computer facilities available to them and may develop similar systems of their own in the future but little is being done currently.

The base maps upon which MAGI was built came from a variety of sources including some prepared from LANDSAT imagery (A mosaic of the whole state is one example.) and high altitude photography. Most useful were the State Highway Administration's map series on a scale of 1:63,360.

The Planning Department has little cartographic or photointerpretive capability and uses the University of Maryland's Time Sharing System Univac 1101 Computer and a DCP 500 Teletype console.

A Land use inventory was made on a scale of 1:126,720 (1" = 2 miles) based primarily on high altitude color infrared provided by NASA in 1970. (Mission 144). In 1973 additional photography provided by NASA permitted a change to 1:63,360 which coincided with the State Highway Administration maps. Updating is done on special supplementary tapes when needed and the master tape is updated triennially. LANDSAT imagery will be used on a regular basis.

The MAGI system geocodes all polygons, lines, and points by reference to the State Coordinate Grid System. A cell size of 2000 ft. x 2000 ft. (approx. 91 acres) is used.

The MAGI system is a digitized overlay system. It is described as a "manual overlay of plastic maps describing variations in geography (e.g., soils, geology, vegetation, etc.) at a constant location. The automated computer files in the system contained each variable according to a matrix of numerical codes. These digital matrices can be overlaid to create a numerical composite, subsequently produced in map form by the computer. Normally, this is accomplished by assigning values to the variables according to some interpretation. For example, the combination of information concerning soil type, topographic slope, and vegetation type can provide a generalized picture of the erosion properties of

Maryland (continued)

in a given area. This determination requires the development of quantitative indices of soil, vegetation, and slope as they relate to each other and as sub-classes relate within major classes. In this way, qualitative variables are interpreted and combined quantitatively to express some conceptual understanding of landscape processes, capabilities, and suitabilities."

The MAGI system is used in planning and analysis studies, project and plan review, and for basic data retrieval. It has extensive modeling capabilities and a number of complex geophysical and socio-economic models have been developed, e.g., Mining/Extraction Model - identifies, by grid cell, areas suitable for mining; Productive Agriculture Model - identifies areas suitable for intensive cropping or special practices; Urban Models - identifies areas suitable for following urban land use sets: Urban Centers Model, Intensive Residential Model, Low Intensity Residential Model, Industrial Location Model, Conservation Model, Forestry Model, and Fishery Model. Many sub-models of the foregoing have been developed (e.g.) natural processes and hazards, tourism, and agriculture encroachment.

CONTACTS:

1. John Antonucci, Project Director, Dept. of State Planning, 301 W. Preston St., Baltimore, Maryland 21201, (301) 383-2472.
2. John Morgan, Planner, Dept. of State Planning, 301 W. Preston St., Baltimore, Maryland 21201, (301) 383-3067.
3. Donald Outen, Planner, Dept. of State Planning, 301 W. Preston St., Baltimore, Maryland 21201, (301) 383-3067.

MASSACHUSETTS

Summary of State Role

Several cities and towns in Massachusetts have attempted to utilize modern data processing techniques. However no really significant multi-purpose geobased system has been developed. The lack of state-wide standards and technical support have lead to the development of systems that produce products that bear little or no relation to the needs of other users of the same information.

The Massachusetts Land Records Commission is seeking to correct this situation. A report by the Commission recommending a multipurpose, geobased information system and a program for achieving is now (October 11, 1975) in draft form.

The proposed land data system is expected to operate as a joint venture of the registries of deeds, the Land Court, municipal assessors and the Commonwealth.

Although it will be difficult to obtain funds for any new program under current economic conditions, the Supreme Judicial Court ruled on December 24, 1974 that the State must provide direction and leadership in this area. Moreover the assessors must meet the constitutional requirements of annually updating their fair market value assessments.

The Land Records Commission feels that New York and Arizona have demonstrated how this can be done effectively and efficiently with a computerized geobased land information system. They are also convinced that such a system is needed for more general public policy development and planning.

The Land Records Commission has already embarked upon the design and specifications for a system of large-scale property maps that might be established by the State. A report on the recommended map content and other specifications is now in preparation, and is due for circulation in early 1976.

The Commission is doing its best to develop standards and work out a regional mapping program with the other New England states. Municipal mapping programs are going on all over Massachusetts and several of the other northeast states as part of required reevaluation programs but the lack of coordination makes it difficult to piece together the resulting maps for use in broader land analyses programs. (Possible application of LANDSAT type imagery here and in the updating process are obvious and are being considered by McDonald Barr.)

Massachusetts (continued)

The operating costs of Massachusetts proposed system may be carried through the imposition of special fees to be collected through the registries of deeds and through the Land Court.

The Commission is planning on a small demonstration program which, hopefully, will grow from a single locality to cover the whole state. They are now seeking "front end" money for this project.

CONTACTS:

1. McDonald Barr, Director, Dept. of Community Affairs, 141 Milk Street, 5th Floor, Boston, Massachusetts 02109, (617) 727-6406.
2. Frank Keefe, Director, Office of State Planning, One Ashburton Place, Boston 02202, (617) 727-5066.
3. Constantine Constantinides, Chief Planner, Office of State Planning, One Ashburton Place, Boston 02202, (617) 727-5066.
4. Matthew B. Connolly, Director of Coastal Zone Management, Office of Environmental Affairs, 100 Cambridge Street, Boston 02202, (617) 727-2808.
5. Howard Bennett, Director of Technical Services, Boston Redevelopment Authority, City Hall, Boston, 02201, (617) 722-4300.

MICHIGAN

Summary of State Role

Governmental agencies in Michigan at the state, regional and local levels are presently investigating a number of land use monitoring and inventory schemes.

Michigan State University, with support from NASA's Office of University Affairs, is studying use of remote sensing for land use decisions. Areas of investigation include development of a standardized Michigan land cover/use classification system of planning for river basin management, assessment of highway corridors, development of county enforcement of the state Soil Erosion and Sedimentation Control Act (P.A. 347-1972), development of procedures for the state Farmland and Open Space Preservation Act (P.A. 116-1974), land value assessment, implementation of a county plan to locate and remove abandoned vehicles, identification of rural water supplies for fire fighting, and siting of agricultural processing plants.

A comprehensive land cover inventory for the Kalamazoo River basin has been completed under an agreement established with a multi-agency team headed by the U.S. Soil Conservation Service (SCS). This work was completed in two stages. The first stage involved a demonstration of the scope and efficiency of small scale color infrared imagery (NASA, RB-57) in providing land use data for the Upper Kalamazoo watershed (2,800 sq. km.). The successful provision of these results lead directly to the second stage of the work which involved mapping 22 categories of land use with a 4 hectare minimum type size for the remainder of the basin (5,600 sq. km.), using commercially acquired color infrared imagery. The resultant land cover maps are being used by the SCS with other natural resource information to formulate coordinated conservation programs.

In Grand Traverse County, Michigan a land cover inventory (24 categories) and special environments inventory (34 categories) were derived from 1:36,000 color infrared imagery. Six land use classes and seven types of special environments were designated for identification per four hectare grid and were coded for computer analysis and presentation. The data are being utilized as a resource base for county planning decisions and are providing a framework for local government participation in highway corridor evaluation and selection. This study was a cooperative effort between Grand Traverse Bay Planning Commission, the Michigan Department of State Highways and Transportation, the Department of Natural Resources, Office of Land Use, and the Michigan State University Project.

Michigan (continued)

The Antrim County Planning Department uses color infrared photography to expeditiously evaluate site plans required for earth change activities and potential violations relative to the Soil and Sedimentation Control Act. In Charlevoix County, the Equalization Department uses color infrared photography to more accurately reassess land values, particularly for inaccessible properties. Passage of the new Farmland and Open Space Preservation Act in Michigan has made the location and extent of such areas, a prime concern to land owners wishing to take advantage of the income or property tax benefits this Act provides through development rights agreements or easements, and to ensure that land remains in such uses for an agreed upon period. Wayne County, (which includes the City of Detroit) was the first county to implement the Farmland and Open Space Act. With MSU Project assistance, an inventory of current land uses was derived from aerial photography for the undeveloped portions of the county. Farmlands and other open spaces were identified through these studies; particular areas were evaluated as important/crucial terrain which should be retained as permanent open space; and these evaluations are being applied as the bases for reformulating land use and zoning ordinances.

The Remote Sensing Project has also worked with the Antrim County Planning Department on two additional applications. First, a county-wide survey was conducted to locate and count abandoned vehicles using 1:36,000 color infrared photography. Once owner releases are secured the vehicles will be removed for salvage and then a county junk vehicle ordinance prohibiting abandoning of vehicles in unspecified areas will be enacted. Second, in rural areas such as Antrim County, a major problem is lack of adequate and readily available water supply for use by fire fighting units. All units reporting to a fire outside of village limits, have an on-board water supply. When this supply is expended the unit will depart the scene of the fire and recharge its water tanks from the nearest available source of water. It is critical in terms of time delay, that the unit only travel to the nearest suitable source. In order to better document the water sources (natural lakes and ponds, streams and rivers, and man-made ponds) available throughout the county, an inventory is being conducted from color infrared imagery.

In Saginaw Bay area, beans, corn and small grains are important crops requiring immediate processing for storage and marketing. It is economically and technically crucial that processing facilities be located within high crop production areas. MSU Project personnel, in cooperation with a large agribusiness, are investigating the use of Skylab and NASA research aircraft imagery to acquire an improved data base for corporate decisions aimed at optimizing the location of future elevator facilities with respect to crop production areas and transportation accessibility.

Michigan (continued)

(Based on a paper by Myles Boyland, Wm. R. Enslin, Richard Hill-Rowley, and Raymond D. Vlasin at the 10th Int. Symposium on Remote Sensing of Environment, October 1975)

CONTACTS:

1. Myles G. Boylan, Professor, School of Urban Planning and Landscape, Michigan State University, East Lansing, Michigan 48823, (517) 353-9226.

MINNESOTA

Summary of State Role

Minnesota, with one major urban center, has an active state program in land use management. A Minnesota State Land Use Map was prepared in 1969 from visual interpretation of aerial photographs. Studies since then have related this work to LANDSAT imagery and a NASA contract (NAS5-21742) with Honeywell resulted in 1974 in an automatic photointerpretation system for land use management in Minnesota.

The State Legislature has created a Regional Government Agency for planning of a seven county district including Minneapolis and St. Paul. Called the Metropolitan Council and located in St. Paul, this agency is involved in planning of land use, sewer, water, dwell and industrial permits, criminal justice activities, etc. The Council uses a geographic management system based on aerial photography taken in 1970. The system is in the GBS/DIME format and used on a Burroughs 4700 in Minneapolis.

CONTACTS:

1. John Asmuf, Manager, Data Processing, Minneapolis, (612) 348-2520.
2. Roy Larsen, Metropolitan Council, St. Paul, (612) 227-9421.
3. Dwight Brown, Minnesota State Land Use, (612) 373-5372.

MISSISSIPPI

Summary of State Role

The State of Mississippi is working on a digital land use classification system based on LANDSAT, in cooperation with the State of Louisiana. This work is funded by NASA and a \$400,000 grant from the National Science Foundation. NASA is supplying information, including aerial infrared photography as well as LANDSAT 1 and 2 imagery. The state is being mapped in 40 acre grids.

Jackson, Mississippi has developed a GBE/DIME file and has used it to create a Street Data file which will be used for transportation planning, street construction, and maintenance. The DIME file is also being studied for use in police statistical reporting and emergency vehicle dispatch.

CONTACTS:

1. Preston T. Bankston, Director, Office of Science and Technology, 510 George St., Jackson, Mississippi, (601) 354-6517.
2. Claude E. McCants, Jackson City Planning Board, 218 South President St., Jackson, Mississippi, (601) 354-2336.

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MISSOURI

Summary of State Role

There presently is no statewide land use classification program, but a committee of the State Interdepartmental Council is developing such a system under Steve Boody, Office of Administration, Division of Planning and Analysis. In addition, several significant land use classification activities are proceeding in the state.

St. Louis County

Under John Baggs, County Planner, St. Louis County has developed a computerized "Land Data Base" covering the 320,000 land parcels in the county geocoded on a point and grid system to include such data as location, ownership, subdivision, lot number, land use, improvements, council district, school, fire, taxes, etc. The data are now being verified, cross-checked and corrected using various official records, windshield and door-to-door surveys. There are three night shift employees entering corrections of errors found during the day shift. Some printouts have been used in pilot studies, but the system is not expected to be debugged and operational for another year or more.

Soil Conservation Service

Purdue LARS is developing a soils mapping program for Ival Persinger of the SCS at Columbia. Two scenes - spring and fall of 1974 are being classified at 1:24,000 scale, using a line printer output. Eighteen categories have been identified and are now being verified in the field. There appears to be a high reliability. The contract, at \$20,000 covers 20 counties on a watershed basis.

University of Missouri at Rolla

David Barr at the University of Missouri is testing the economics of using LANDSAT data versus other methods. A student is mapping La Clede County, using a LANDSAT color composite transparency and comparing his results with those previously obtained by LUDA based on classified aircraft data and NASA using LANDSAT tapes.

Missouri (continued)

In addition he is performing Level I classification of the entire state using LANDSAT imagery.

CONTACTS:

1. John Baggs, County Planner, St. Louis County, (314) 889-2000.
2. David Barr, University of Missouri at Rolla, (314) 341-4751.
3. Ival Persinger, SCS at Columbia, Mo., (314) 442-2271.

MONTANA

Summary of State Role

Statewide Involvement. The major program is under Albert Tsao, Administrator, Energy Planning Division, Department of Natural Resources and Conservation. This system, ERGIS for Environmental Resources Geo Information System uses an automatic digitizer system with raster scanner, and a DCC minicomputer with 16 K core. ERGIS is used in all statewide land use planning purposes and is particularly useful in selecting routings for high voltage transmission lines.

CONTACTS:

1. Albert Tsao, Administrator, Energy Planning Division, 32 S. Ewing Street, Helena, Montana 59601,
(406) 449-3780.

NEBRASKA

Summary of State Role

Remote sensing activities in Nebraska are closely linked to activity in land use monitoring. The Nebraska Remote Sensing Center coordinates this work for all State agencies and maintains contact with regional agencies concerned with planning, inventory, and land use monitoring.

The NRSC has published land use maps of Nebraska on a scale of 1:1,000,000 with level 1 use categories, entirely based on LANDSAT data analysis. More detailed mapping has been and is being done for smaller areas. Using LANDSAT imagery, the Center has mapped Dawson and Phelps Counties, with the detail of land use categories halfway between the Anderson level 1 and level 2 categories. (Irrigated row crops, dry land row crops, alfalfa, range land, urban areas, water, and wetlands are identified in these maps.)

More detailed maps, with level 2 categories, are being prepared with the aid of LANDSAT and aerial photography. Each map covers a natural resource district, with boundaries selected with regard to both political boundaries and abrupt changes in land use. Typically, a natural resource map covers 4 to 5 counties. A level 2 map completed in this project is the Eastern Nebraska district, inventoried by 10 acre parcels. Lancaster County, which contains the city of Lincoln, has been mapped at a scale of 1:63,360 (1 in. equals 1 mile). At present, the Central Platte River district and the north central Nebraska district are being mapped.

These land use maps are put to extensive use, although there is no formal program of applications. The State Office of Planning and Programming is the foremost customer. They have requested and obtained land use maps of Lancaster County in a time sequence based on ASCS photography of 1949, 1959 and 1965. The land use inventory for each date was analyzed by 10 acre cells and digitized for input to an IBM 360. Currently, similar work using 2 1/2 acre cells is being done for the Omaha area.

The city of Omaha, interested in application of this work, is covered by a GBF/DIME file of the Omaha-Council Bluffs Metropolitan Area Planning Agency. This Agency has developed ODIS (On-line DIME Implementation System), a maintenance program which includes a routine for address coding of aerial photography and existing maps to update the file.

Nebraska (continued)

CONTACTS:

1. Dr. Rex Peterson, Nebraska Remote Sensing Center, University of Nebraska, Lincoln, Nebraska 68509, (402) 472-3471.
2. Mr. Stephen Kinzy, Omaha-Council Bluffs, MAPA, Omaha, Nebraska 68106, (402) 397-0330.

NEVADA

Summary of State Role

The University of Nevada has conducted a number of LANDSAT and other remote sensing studies in which the operating agencies of the State have participated by providing ground truth. However the State Highway Dept. has played a leading role in developing the standard DIME Geographic Base File which is now being used by Las Vegas, Reno, Clark County, and the regional planning agencies in Clark and Washoe counties. The basic coding guide was developed in 1969 by the Highway Dept. The files were updated in 1972 following the Bureau of Census' DIME format and more and more sophisticated programs have been added to the system. The areas of application have grown steadily in a largely informal manner when first the Clark County School District and then other agencies started to make use of the Highway Dept. File. Both grid mapping and SYMAP programs are now available.

There was considerable resistance within some of the potential user agencies in the beginning. They were afraid that the security of the files would be endangered and that confidential information would be divulged. This was resolved by foregoing the development of a large base file of information by simply utilizing the block, tract, and traffic zone tags developed by the Highway Dept. on the various file data of each agency. Each agency now can maintain the security of its own files and only releases summary data when requested. Subsequently the regional planning agencies, in conjunction with assessors' offices in both Washoe (Reno) and Clark (Las Vegas) counties have begun to develop land use inventory files which allow printouts of land use by address and acreage within neighborhood zones.

The Regional Planning Commission of Reno, Sparks, and Washoe County has developed and is just putting on line (November 1975) its own system and Clark County has a similar system in operation. The Washoe County Regional Information System is still using the State Highway Dept. computer facilities (an IBM-370) but expects to switch to a new DEC-10 computer which Clark County expects to install in 1976.

The development of these regional systems has taken place in an informal almost unplanned way. The Clark County School System sought help in its bus routing which was expanded to include scheduling and other assistance. Later other Clark County agencies began to make use of the Highway Dept. facilities and expertise. Reno and Washoe County followed and the Highway Dept. is now working with other organizations. A description of the Reno, Sparks and Washoe County Planning Commission is

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Nevada (continued)

given below. Being newer it may have more capabilities than Clark County's system but they, and any newer systems under development with the Highway Dept. are similar in nature.

Note that none of these geobased information systems depend very much on remote sensing. The University of Nevada has conducted LANDSAT and other remote sensing activities. Their photomaps of Nevada have been used by State agencies but the involvement of these agencies in remote sensing has been minimal - perhaps because of limited budgets.

Washoe County Regional Information System

See "Summary of State Role" for information on the role of the State Highway Dept. in developing this system.

This system, financed in part by a HUD grant, is built upon the DIME files and programs of the State Highway Dept. It is still linked to the state's computer. They are still (November 5, 1975) debugging their programs and will not be able to switch to their own computer until later in 1976.

The system will start with 30,000 parcels and will be operated by the Planning Dept. of the Regional Commission. Mapping and the base maps are of minor concern to the system operators. They are using planimetric and property maps provided by the Highway Dept. and the Real Estate Board. (Scale 1:200 to 1:2,000) The System will be used for land and facilities planning, school zoning, busing schedules, transportation studies, and demographic studies.

Presently they are using the Highway Dept.'s IBM 370 and Digitizer but will later switch to a DEC-10 which will be installed in the County Computer Facility in 1976. At least six agencies will have input-output terminals. Data will be kept current by automated recording of land and other pertinent transactions.

System cost \$100,000 for hardware, and will cost \$50,000/year to operate.

Nevada (continued)

CONTACTS:

1. G. B. Westenhoefer, Dept. of Highways, Highway Building, Carson City, Nevada 89701, (702) 885-5440.
2. Stephen T. Bradhurst, The Regional Planning Commission of Reno, Sparks, and Washoe County, P.O. Box 1286, Reno, Nevada 89505, (702) 323-8691.
3. Edward F. Davis, Executive Director, Clark County Regional Planning Council, 118 S. 4th St., Las Vegas, Nevada 89101.
4. Jerry Aho, Analyst, Clark County Data Processing Service, Las Vegas, Nevada 89101, (702) 386-4011, ext. 511.

NEW HAMPSHIRE

Summary of State Role

Neither the State nor any of the local or regional authorities have geographic based information systems in which remote sensing might play a significant role. (See Massachusetts report for possible regional approach in use of remote sensing.)

NEW JERSEY

Summary of State Role

Trenton is developing the "1984 System", a geographical code for use on a small computer; the city's IBM 3 Mod 10 (24K memory). The project started with available city maps, but these were found to be inaccurate and out of date, requiring revisions based on known modifications. The project is basically a shoestring effort being done in house by the city government. No current aerial photography exists, but the need is recognized and attempts are being made to arrange aerial photography through National Guard assistance.

Despite these Spartan conditions, the 1984 System is developing. Every street has been coded into the data base as two alphanumeric characters, and intersections are coded by number. The intent is to identify one-way streets and the nature of street paving. Property addresses, water billing, and tax assessment information will be cross-referenced. The most urgent present need for the system is the routing of garbage trucks. It is also planned to use the system for the Planning Department, the Engineers Department, the Assessors Department, and the Police Department, which currently uses a cruder system for vehicle control. Output will all be tabular, since no plotters are available.

Plainfield is preparing a county-wide geographical system. Originally intended for analysis of fire-truck dispatch needs, the system will eventually be employed as a land use program.

Newark has no existing geographical code. There are plans to develop one for the Newark Police Department, based on existing mapping of the city. The plans are tentative and no definite details are available at this time.

Currently in the planning stage is a geographical system to meet the needs of the N.J. Coastal Zone Management Program. The request for proposal, issued by the Program, calls for use of an IBM 371-45 to retain the data base, and a minicomputer to provide output.

CONTACTS:

1. Major Weber, Administration Dept., City Hall, Trenton 08608, (609) 392-3441.
2. Dr. David Kinsey, N.J. Coastal Zone Management Program, N.J. Dept. of Environmental Protection, P.O. Box 1390, Trenton 08625, (609) 292-8262.

NEW MEXICO

Summary of State Role

There is presently no statewide land use information system nor enabling legislation to provide for one. The executive branch is once again sponsoring such legislation. The state planning office is presently working on a "critical areas" study and implementing a natural areas survey, both of which would be applicable to a future system when and if authorized by the legislature. Both of these studies could well be amenable to utilizing LANDSAT data now, but it is not now being used.

CONTACTS:

1. John Samuelson, State Planning Office, Executive Legislative Building, Santa Fe, New Mexico 87501, (505) 827-5233.

NEW YORK

Summary of State Role

Land Use and Natural Resource Inventory System, otherwise known as LUNR, is based on a study of aerial photography of the State taken in 1967-1970, and on unpublished maps of specialized data. The data are summarized for 140,000 grid cells covering New York, each one square kilometer (247.1 acres) in size. Percent of land use in each of 51 categories, lengths of linear features (e.g., roads), and numbers of certain point items (e.g. structures, ponds) found in the cell are stored by cell, and the cell is identified by the coordinates of its southeast corner. These data are stored on an IBM 2316 disk. A second disk stores soil type, geological type, economic viability of agricultural use, and depth of bedrock.

Output of LUNR data is of two types. Using the DATALIST program, tabular lists and summaries are generated. Using the PLANMAP program, computer graphic maps are generated.

New York State is preparing a state Land Related Information System to update and expand the original system (LUNR) currently in use. This second generation system, now in sample area testing, provides user service for HUD 701 land use, Coastal Zone Management, EPA areawide applications, and State area studies. Like LUNR, the updated system is based on aerial photography for land use identification, overlaid on 7.5 min. USGS maps.

There is no formal budget for this work.

CONTACTS:

1. Charles R. Guinn, Chief, Data and Systems Bureau, Office of Planning Services, New York, (518) 474-4131.
2. William Harting, Tri-State Transportation Commission, 100 Church Street, New York, New York 10007, (212) 938-3300.
3. Larry Stid, Genesee/Finger Lake Regional Planning Board, (716) 232-1060.

NORTH CAROLINA

Summary of State Role

Planning and Land Use Management

The State Land Policy Act of 1974 calls for the creation of a land use plan which is now being prepared by the Department of Administration, Office of State Planning. The plan will then be returned to the legislature for approval and implementing legislation. The central feature of this plan is a land classification system with classifications based on public investment in public services. All state lands will be put into one of five classes:

1. Conservation (Stream bottom or flood plain).
2. Rural Resource (Agriculture and Forestry).
3. Rural Community (No water and sewer needed).
4. Transition (Needing urban services within ten years).
5. Urban.

The system, acronymed PLUS is planned to be computerized using geocoded grid cells of 256 hectares. Under present plans, the state will define the characteristics of the coding but the counties will classify their own land within state specifications. 1970 Census data has been coded into 256 hectare cells. The system will utilize the computer services of the Triangle University Computation Center.

Coastal Area Management Program.

Under the Coastal Area Management Act, and somewhat keyed to the land policy act, the Department of Natural and Economic Resources, Office of Marine Affairs has set up a program for the twenty coastal counties. In this program too, the state sets the guidelines and each community develops and implements its individual plan within these guidelines. The program is geared toward planned and orderly development in coastal areas. Preliminary plans are due from communities by November 1975, with revisions, public hearings and final approval scheduled to be completed by May 1976.

Meanwhile, the Coastal Resources Commission is determining areas of environmental concern for permit action and enforcement.

The Coastal Area Management Program is using remote sensing (aircraft) to prepare orthophoto-quads where present 7 1/2 minute quads are inadequate. The total cost of the Coastal Area Management Program at present is \$300,000 per year.

North Carolina (continued)

Forsyth County

Under a \$1.5 million contract, Utility Data Corporation of Houston (UDC) is developing a total system for Forsyth County. The entire county was flown. Then street intersections and roadways were digitized, then each parcel was digitized and geocoded. The system uses a dedicated Burroughs B3700 computer. Upon completion of the contract, UDC has offered to maintain the system for 15-30¢ per parcel per month, or about \$30,000 per month for the 120,000 parcels in the county. This would include biennial overflights. The population of Forsyth County is 240,000, of which 150,000 are in the City of Winston-Salem.

CONTACTS:

1. Steven Thomson, Director, Land Policy Division, Dept. of Administration, Raleigh, (919) 829-4131.
2. Ronald F. Scott, Planning Officer, Office of State Planning, Dept. of Administration, Raleigh, (919) 829-4131.
3. Stan Heckler, Director, Office of Marine Affairs, Dept. of Natural and Economic Resources, (919) 829-2293.
4. W. Sanders Moseley, Director, Data Processing, Forsyth County, Winston-Salem, North Carolina 27101, (919) 727-7597.

NORTH DAKOTA

Summary of State Role

A program is just starting under Oscar Lund, Land Use Coordinator of the State Planning Division. Lund has just come to North Dakota, having recently set up the South Dakota system. The program is being formed under the Regional Environmental Assessment Program, and while there is a limited budget, he expects major funding from the Coal Impact Assessment. Lund plans to develop a system making maximum use of LANDSAT data, which he hopes will continue to be available. He expects to have a program plan ready by January 1976.

CONTACTS:

1. Oscar Lund, Land Use Coordinator, Planning Division, Bismarck, North Dakota, (701) 224-2819.

OHIO

Summary of State Role

The Development Planning Division of the State Department of Economic and Community Development, with an ERTS follow-on contract with Goddard Space Flight Center, arranged a meeting last March with the State Department of Natural Resources and the State Environmental Protection Agency. As a result of the meeting, a joint agreement was announced by the three agencies to the effect that a statewide land use inventory, flexible in scale and detail, was needed. Specifications were developed, the most prominent being that the inventory should be computer processable. The central processing system of the State operates an IBM 370/145, and therefore the system would be coded for this. Inventory classifications would include eight level 1 classifications and a variable number of level 2 classifications, applied to individual scenes as appropriate. The land use system was to be based on LANDSAT imagery, with potential for input of U2 and low flying aerial photography.

Plans are to complete the land use inventory in the spring of 1976. Applications are already being prepared. At the state level, three major users will be

(1) the Department of Natural Resources. To facilitate use of the inventory, DNR has written software for its application to the Department's capability analysis program.

(2) the Department of Economic and Community Development. This Department has recently prepared a concept paper for using the land use inventory for a spatial allocation model. This model has the purpose of evaluating needs for public services, optimum directions and timing of industrial growth, and impacts of taxation. The Department wants to develop software to guide State policies.

(3) the Environmental Protection Agency. This Department has a grant from the U.S. Environmental Protection Agency to develop a model for water quality management. Plans are to use the land use inventory based on LANDSAT in this model.

Other user groups are being identified. Various multicounty organizations plan to use the inventory for such data as timber inventory, zoning in rural areas, etc. The Ohio Power Siting Commission, part of the State EPA, plans its use in power plant siting. OPSC is intended as a "one-stop" operation for approving power plant siting. Surface mining, regulated by the Dept. of Natural Resources, will be identified in the inventory.

The Development Planning Division, preparing this inventory, has a budget composed of \$80,000 from the Dept. of Natural Resources, \$39,000 from NASA, \$20,000 from the Dept. of Economic and Community Development, and \$14,000 from the State Environmental Protection Agency. Of this total, \$112,000 is the budget for the land use inventory.

Ohio (continued)

The Ohio Department of Natural Resources, beginning in 1972, established the Land Capability Planning Section in its Planning Division. This organization is evaluating the ability of the land to accommodate various types of development, as part of land use planning. A land capability analysis has been developed for several areas, including Massie township in Warren County, Wolf Creek in Summit County, and Stark County. The analyses have been carried out with the aid of a computer program, the Ohio Capability Analysis Program (OCAP). OCAP uses maps containing the basic information, and is therefore an adjunct to the current land use mapping described above.

Ohio is a state with many urban centers, and many of these have ongoing programs for geographic location systems. Akron is developing an Akron Metropolitan Information System (AMIS). This system will use a GBF/DIME file obtained from the Northeast Ohio Areawide Coordinating Agency. AMIS is projected for an IBM 375/155 with a Calcomp plotter. Columbus uses a GBF/DIME file obtained from the Mid-Ohio Regional Planning Commission and plans to add data files for land use studies. Lima is exploring the use of existing area files such as GBF/DIME for a land use study.

CONTACTS:

1. Paul Goesling, Chief of Development Planning, State of Ohio, 30 East Broad St., Columbus, Ohio 43215, (614) 466-6954.
2. Dr. Edward Hanten, Center for Urban Studies, University of Akron, 243 E. Exchange St., Akron, Ohio 44325, (216) 375-7616.
3. Eileen Flowers, Mid-Ohio Regional Planning Commission, 514 South High Street, Columbus, Ohio 43215, (614) 228-2663.
4. Ken Betché, Lima-Allen County Regional Planning Commission, 300 Colonial Building, Lima, Ohio 45801, (419) 228-1836.

OKLAHOMA

Summary of State Role

Oklahoma has no statewide information system. Oklahoma City is working on an information system (contact Mike Pugh of city government for update), but it's not yet operational. State and city use ASCS aerial photography, have no formal budget for this work. A statewide 208 study is being initiated.

CONTACTS:

1. Bill Free, Director, State Office of Community Affairs and Planning, (405) 840-2811.
2. Gary Witt, Statewide Land Use Planning, (405) 840-2815.
3. Tony Mayne, Chief Engineers, Environmental Pollution Control Board.

OREGON

Summary of State Role

Oregon participates with Washington and Idaho in the activities of the Pacific-Northwest Regional Commission. This is a regional program to incorporate information from satellite data as the principal basis for determination and quantification of land resources and land use. Land use change and the effects of land management practices will also be monitored. Oregon views this as the start of a regional system fully operational in this decade.

CONTACTS:

1. Walter McCallum, Director, Planning Division, Dept. of Land Conservation and Development, Salem, Oregon, (503) 378-4926.

PENNSYLVANIA

Summary of State Role

The Pennsylvania Department of Environmental Resources is currently preparing a statewide land use inventory. No completion date has been set. With a grant to Penn State University, the Department has set up a coal and energy information system. The information system includes locations of seams, and transport routes. To date, geocoding has been accomplished for the deposits of the anthracite region. Overlays have been prepared for costs, routing information, etc. Plans are to expand the geocoding to include bituminous coal deposits. Other state activity includes a topological and geologic survey by the State Geologist (see contacts).

Of the two major cities in Pennsylvania, Philadelphia and Pittsburgh, only Philadelphia is somewhat active in land use planning. The city is covered by the DIME system and doing a land use inventory in conjunction with the Delaware Valley Regional Planning Commission, which will extend the inventory over nine contiguous counties.

Philadelphia is greatly concerned over an impending shortage of natural gas. The city-owned Philadelphia Gas Works sent representatives to the Sengas group in Nebraska last week (October, 1975) to review results of aerial surveys run for them by NASA. These surveys, making thermograms at 18000 ft. over Nebraska and South Dakota, were capable of identifying buildings with high heat loss due to faulty or skimpy insulation. Philadelphia appears on the verge of funding a program to identify heat waste in this manner.

Reading, Pa. includes a USAC Municipal Geographic Base in its Integrated Management Information System (IMIS). Prepared with HUD support, this IMIS is operable on the UNIVAC 9300 II computer.

CONTACTS:

1. Robert Laughlin, Director, Pa. Office of Science and Technology, (717) 787-4147.
2. Dr. Walter K. Johnson, Delaware Valley Regional Commission, (215) 567-3000.
3. Dr. Art Socolow, Pa. State Geologist, (717) 787-2169.
4. Dr. I. M. Levitt, Director, Phila. Mayor's Office of Science and Technology, (215) 686-4563.

RHODE ISLAND

Summary of State Role

As in the other New England States, land use planning is primarily under the control of local authorities. However, because of its small size, there is close contact and cooperation between state and local authorities.

The most advanced planning has probably been done by the city of Providence whose Master Plan was essentially completed in the 1960's.

The introduction of new technologies in either mapping or in the development of new information systems is most likely to come through a regional approach. (See Massachusetts report.)

Contact:

1. Dennis J. Murphy, Director, Dept. of Natural Resources, Providence, Rhode Island 02903,
(401) 277-2776.

SOUTH CAROLINA

Summary of State Role

Activity in applications of remote sensing to land use monitoring is minimal in South Carolina.

The South Carolina Resources Commission is supporting a first order land use mapping of the state by a group at Clemson University under Prof. James Hite. The work, using aerial photography of the state, is currently more than half completed.

Development of natural resources inventory systems is coordinated by the Division of Administration in the Governor's office. To determine how best to coordinate a program by the potential users of these systems, Public Research and Management, Inc., was retained. The contractor's report analyzes the needs and the input required to define a system with a common data base meeting the needs of all potential State agency users. The report estimates at least \$80,000 would be needed for this effort. There is a South Carolina Aerial Remote Sensing Information Committee which meets informally and is available to provide technical assistance should a program be initiated. Dr. Roger Holmes is chairman of this committee.

CONTACTS:

1. Norman K. Olson, South Carolina Development Board (Geology Dept.), Columbia, S.C. 29208, (803) 758-6431.
2. James Hite, Agricultural Economics, Clemson University, Clemson, South Carolina.
3. Robert Stubing, Public Research and Management Inc., 157 Luckie St., N.W., Atlanta, Georgia 30303, (404) 525-5687.
4. Roger Holmes, Dean of College of Engineering, University of South Carolina, Columbia, S.C. 29208, (803) 777-4177.

SOUTH DAKOTA

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Summary of State Role

Although there is no statewide planning authority, Paul Tessar, director of the state Land Use Information Program and his staff of two have developed a significant program. They have completed a 1:1,000,000 state-wide generalized land use map using visual interpretation of LANDSAT imagery. They are currently interpreting digital LANDSAT data using IBM 370/145 hardware at the University of South Dakota with interactive terminals and an in-house developed software package LIMAP. Approximately one fourth of the state is now complete at 1:24,000 using 10 acre cells. Completion is scheduled for July 1, 1976. Dissemination of products is through the six substate planning districts (which have actual planning authority) and some in Indian reservations.

In addition, Tessar is developing a comprehensive information system, digitizing soils data, land suitability studies and is planning to include socio-economic data.

The office has a budget of \$105,000/year.

CONTACTS:

1. Paul Tessar, Director, South Dakota Land Use Information Program, State Planning Bureau, Pierre, South Dakota 57501, (605) 224-3661.

TENNESSEE

Summary of State Role

The State Planning Office is committed to automatic processing (computer of land use data). They are convinced that it is the best, if not only, way of comparing and integrating complex data from a variety of sources and making use of it on the state to the local level. They spent three years studying various systems and programs and found none completely satisfactory. Of primary importance to them were the cost of data insertion, program running, and hardware. They are now developing their own software. Software is being written by Computer Sciences Corp. under grant from NASA/MSFC. Interim software has been prepared by the State Information Systems Division (SISD) of the Tennessee Finance and Administration Department and used in "Show and Tell" demonstrations to local bodies. Decisions will have to be made as to whether local bodies will use Natural Resource Planning Aid System (NRPAS) software and their own computers or use a terminal into the State system.

District agencies have participated in the development of the NRPAS and in a year long study funded by the Appalachian Regional Commission on the cost effectiveness of remote sensing. The major products produced to date have been land use maps which can be rapidly updated. They have been used in multi-county airport and railroad transportation planning studies, natural resources studies, water and sewer plans, and in housing and neighborhood analysis and population studies.

The State Planning Office is using natural boundaries in preparing most of these maps on the theory that it forces the district planners to look at their areas in a new perspective, forcing them to at least look at the interrelationship between adjacent towns, counties, and districts. There has been some objection to this at the lower levels.

Nashville, Chattanooga and some other localities are using geobased systems for such municipal operating as school bus routine, population distributions, and police and fire operations. The Nashville-Davison County Municipal Government (described below) is probably the most advanced in the state but remote sensing does not play a serious role in any of them.

The Nashville-Davison County Metropolitan Regional Government put on-line in March 1975 a multi-purpose geobased information system. This system uses an IBM DL-1 data base softward package written in COBOL. The Land and Mapping Program (LAMP) has three primary computer files: a land use (ownership) parcel file, a utility parcel file, and an environmental file. There are over 180,000 parcels. Accurate base maps were available from a variety of sources (Scale 1:200 to 1:20,000). Most mapping is done by field survey and automated plotting. The Planning Dept. has a competent mapping section and does its own digitizing.

Tennessee (continued)

This system serves primarily as a sophisticated data bank. Land records and tax assessments, sewer and utility records, and geobased information for other departments are kept current. No projective planning or modeling is done but records are kept current by direct input daily from the user departments. Input/output facilities are available at 60 non-dedicated video terminals and teletype terminals distributed throughout the municipal government. Separate from the land use system is an older management information system which can make use of data from the new program. New software is being developed for both systems.

Indexing is done by place name, Tenn. State Plane Coordinates, address, intersection reference, and point.

A minicomputer PDP 11/35 is used to maintain the system on near real time. This feeds the City/County's IBM 370/145. Operating costs ran about \$2-3,000/month.

The City/County planners know about the State's plans for a geobased information system but do not feel directly involved. As software and the possibility of direct linking to the State system develops they may show more interest.

CONTACTS:

1. John Wilson, Director, Natural Resources Planning, State Planning Office, 660 Capitol Hill, Nashville, Tennessee 37219, (615) 741-1676.
2. Ronald Dickie, Director, Data Processing Dept., Metro Office Building, 700 2d Avenue, Nashville, Tennessee 37201, (615) 259-5671.

TEXAS

Summary of State Role

The remote sensing and data analyzing capabilities of the operating agencies in Texas are being integrated into the Texas Natural Resources Information System which has been under development since 1972.

The NRIS is not a statewide geocoded (Cadastral) system nor is it even a "system" in conventional systems engineering language. NRIS is defined as "a service mechanism for (1) assembling data in both machine processable and non-machine processable forms; (2) processing these raw data into physically meaningful data; (3) adjusting and organizing processed data into forms and formats suited to modern storage, retrieval, and manipulative procedures; (4) storing these data in a systemized information base; (5) disseminating data from this base of information; and (6) manipulating and processing these data into graphs, models, study plans, specifications, and simulative systems needed to manage natural resources, as determined by user requirements."

Presently natural resource data is being collected by many State agencies in accordance with their individual responsibilities. The NRIS will weld together the capabilities that already exist in the Texas operating agencies in a comprehensive and cost-effective system.

The Texas Water Oriented Data Bank (TWODB) is serving as the operational nucleus of the TNRIS. The TWODB currently uses the Texas Water Development Board's Computation Center which provides diverse capabilities for storing and retrieving data. Demand processing capabilities exist via CRT, teletype, and other hard-copy computer terminals while digital plotting equipment and graphic display terminals will permit ready man/machine interfacing. Computer-output microfilm and maps and charts are also available. The TWODB facility is being expanded and linked to the other participating agencies.

TWODB already has the capability of analyzing remotely sensed data in both digital and imagery form (as do some of the other participating agencies) and a TWODB software package known as Monitor, permits easy retrieval and processing of their files via a simple question-and-answer routine over a computer terminal.

Although the TWODB is serving as the nucleus of the NRIS, the information base will not be centralized. Each agency will continue to maintain its own information files. The NRIS will serve a coordinating function and will be structured similarly to the USGS National Water Data Exchange System (NAWDEX).

Texas (continued)

Several Texas cities are making use of geobased information systems. In general they use the Bureau of Census DIME files modified for their needs. No city appears to be very heavily involved in the development or use of the State NRIS program.

Updating is normally done in response to two general situations:

- *The subdivision and development of areas within the current corporate limits.
- *The annexation of new territory and inclusion inside the corporate areas.

Photomapping is usually done on an ad hoc basis with low level aircraft. The various Councils of Government are monitoring the development of these State and City systems and some play a minor role in coordinating such activities but no COG is exerting a leadership role in the development of geo-based information systems.

The city of Wichita Falls, Texas has designed a totally Integrated Municipal Information System (IMIS). IMIS has a monthly budget of \$35,000, and is used with an IBM 370/145. It is transferrable to other cities, and includes a full range of municipal functions: public finance, public safety, physical and economic development, administration, and human resources development. IMIS includes the Geographic Base Index System (GBIS), which is a set of procedures and files describing geographic locations in the city. GBIS uses DIME (Dual Independent Map Encoding, a geocoding system developed at the New Haven Census Use Study in 1967 and used in the 1970 Census in over 190 metropolitan areas). The primary unit of GBIS is the Street Segment Index, constructed for DIME records of street names, segment address ranges, census tract and block, and the x-y coordinates of the ends of the segment. With this capability, events and activities can be statistically analyzed by geographic units to determine needs for increased or specialized municipal services.

Dallas - Urban Planning Dept. Dallas' Tax Dept. Geographic Information System (GIST) is used to maintain their GBF/DIME file. The Tax Dept. is now building a parcel file which will permit the use of GIST in a land use data system now under development. Presently the GBF/DIME file is used to control vehicle tax assignments, population estimates, junior college enrollments, accident mapping and location analysis, and in police and fire department operations.

The Segment File is the basis of the GIST program. It contains all the data for each segment. Three smaller files, the Street File, the Node File and the Block File, serve primarily as indexes to the main file. Retrieval, display and update to the Segment File is done on line via video terminal. All city departments can have access to the system via video terminals and can "browse through the data."

Texas (continued)

Local political districts, planning areas and other geographic codes are entered into the Segment File by a batch processing method. They are now developing techniques for translating their files into a form compatible with such mapping packages as CHORO or SYMAP.

Dallas is also cooperating with the North Central Texas Council of Governments and will maintain the Metropolitan Maps for all of Dallas County while COG will make the address edit corrections. This will probably be extended to cover the rest of the area served by this council.

Mapping is done infrequently on an ad hoc basis using low altitude aircraft.

CONTACTS:

1. C. R. Baskin, Chairman, TNRIS Task Force, P.O. Box 13087, TNRIS Systems Central, Austin, 78711, (512) 475-3312.
2. David L. Ferguson, Secretary, TNRIS Task Force, P.O. Box 13087, TNRIS Systems Central, Austin, 78711, (512) 475-3312.
3. Stephen Ondrejaf, Director, Wichita Falls Planning Dept., P.O. Box 1430, Wichita Falls, (817) 322-5611.
4. Stephen Morath, Sr. Plan. Analyst, Wichita Falls Planning Dept., P.O. Box 1430, Wichita Falls, (817) 322-5611.
5. Dean Morrison, Dallas Planning Dept., Dallas, (214) 744-4371.
6. George Human, City of Fort Worth Planning Dept., Fort Worth, (817) 335-7721.

UTAH

Summary of State Role

Efforts have been made for several years to establish a comprehensive land use program in Utah. In 1973, a bill was introduced in the State Legislature to initiate land use planning, but was defeated. In 1974, a weaker version which would begin a land use planning process was passed by the Legislature, but defeated that November in a referendum vote. The 1975 session of the Legislature has appropriated \$250,000 for the State Planning Office to distribute to local government entities to establish land use management programs and to coordinate with the federal agencies which are involved in the state. (About 70% of the area of Utah is either owned or managed by the federal government.)

This program has only started, and details are not yet available.

CONTACTS:

1. Douglas Kirk, Dept. of Natural Resources, Salt Lake City, Utah, (801) 533-5245.

VERMONT

Summary of State Role

Vermont and its cities have devoted little time or money to the development of geographic based information systems. The federal agencies and the University of Vermont have taken the lead in such applications as pollution control, resource monitoring and the use of the Bureau of Census' DIME files.

Although little is being done in developing geo-based information systems, the entire state is being orthophotomapped at a 1:5000 scale with selected urban areas at 1:1250. Additional maps will be produced by enlargement at 1:2500 and 1:625. This mapping was scheduled to be completed in 1980 but there has already been some slippage due to lack of funds. Maps are being produced by the Dept. of Taxes' Division of Mapping, Emerson Baker is advocating their use as a multipurpose (cadestre) mapping base readily digitized for use with any information system. He sees satellite imagery as a most useful updating tool.

CONTACTS:

1. Hugo John, Acting Director, Water Resources Research Center, Univ. of Vermont, Burlington, Vermont, (802) 656-4281.
2. Aulis Lind, Water Resources Research Center, Univ. of Vermont, Burlington, Vermont, (802) 656-3060.
3. Richard L. Becker, Director, Div. of State Information Systems, Montpelier, Vermont 05602, (802) 828-2334.
4. Emerson Baker, Director of Mapping, Dept. of Taxes, P.O. Box 694, Montpelier, Vermont 05602, (802) 828-2538.

VIRGINIA

Summary of State Role

On February 11, 1975, at a meeting sponsored by the Governor, representatives of all concerned agencies decided to develop a state-wide LANDSAT program as part of a larger land-use and policy planning program. Harold Jones and a core staff in the Planning Office was to have coordinated these activities. Little has been done in the intervening period to develop a real land-use no less LANDSAT program perhaps because of lack of funding. Another meeting will probably be held in January or February, 1976 but it is unlikely that anything of great significance will occur there.

The State has a considerable investment in computer equipment, but it has not been used very much in land-use inventorying or natural resource monitoring. A similar situation exists in the cities, counties, and regional organizations in Virginia. Fairfax County, which has only made limited use of remote sensing except for low-level aerial surveys, probably has the most sophisticated information system and planning program in the State. HUD, which provided the original grant money with which the system was developed is also very much interested in transferring this methodology to other areas.

<u>Metro./Regional Info. Systems/Status</u>	<u>Handling/Storage Procedures</u>	<u>Data Sources</u>	<u>Products Produced</u>	<u>Comments</u>
PLUS (Planning & Land Use System)	Based on use of UDIS.	UDIS Files and programs. Biennial A/C surveys.	Comprehensive District & County-wide Land Use Plan.	Planning process - not true information system. See detailed write-up.
UDIS (Urban Dev. Info. System)	Highly computerized IBM 360 - 370 - 2 subsystems; Parcel File & a development monitoring subsystem.	Biennial I/C survey, construction & other county records.	Computer tabulations, computer graphics, & staff analyses. Cadstral maps with extensive use of overlays.	System methodology relatively easy to transfer to other localities. Modular construction permits partial transfer & usable results from the start. See detailed write-up.

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Virginia (continued)

Fairfax County, Office of
Comprehensive Planning
Stream Valley Board

PLUS (Planning and Land Use System) program is a process rather than a system or program in the classical sense. It includes the preparation of the Countywide Plan and a review process for examining the analyses, assumptions, and recommendations presented in the plan alternatives. The PLUS program also includes the development of new analytical tools for forecasting changes and evaluating the effects of these changes in the physical characteristics of Fairfax County as well as the fiscal structure of the government. UDIS (see below) provides the information base for PLUS planning. PLUS planners are responsible for developing ways to forecast and evaluate the effects of these changes in the physical characteristics of the county. The county planners are examining the possibility of using LANDSAT type data, but their involvement is minimal, being primarily devoted to cooperating with and supporting USGS programs such as the Census City studies and some university environmental studies.

1, 2, 3

PLUS's Physical Analytical Subsystem (as opposed to the Fiscal Subsystem) consists of 5 models: (1) Land Use Model, (2) Storm Water Run-Off Model, (3) Water Quality Model, (4) Air Quality Model, and (5) Transportation Network Model. Computer programs have been developed for some of these models and others are being developed. These programs are independent of UDIS but all depend on UDIS for input.

Walter Monasch is in charge of the PLUS program. Edward Gurski is the appointed official responsible for policy in this area. \$1.5 million (over an 18 month period) was spent developing PLUS and the countywide comprehensive plan. The Stream Valley Board is a scientific advisory board to the Board of Supervisors and Mary Goodwin has been advocating the use of remote sensing in updating county data. (See UDIS below.)

Virginia (continued)

Fairfax County, Office of Research
and Statistics
HUD
American University
Urban Institute
ECCO Consulting, Inc.

UDIS (Urban Development Information System) was developed with support from HUD (See Contacts, below) and in consultation with organizations listed alongside. Project began in 1970 with a \$125,000 grant from HUD and \$140,000 from the county for the design and testing of UDIS in a pilot project. The county received another \$260,000 in 1972 (which the county matched) and the program was extended to the entire county. The system was designed for easy transferability of methodology in whole or in part, to other localities. It is now a permanent and integral part of the County government managed by the Office of Research and Statistics. New components are being continually added.

UDIS is made up of two discrete subsystems. The first is a Parcel File, which is a land use inventory file describing what exists in terms of land use and existing structures. The second is a development monitoring system, which identifies planned residential and non-residential development.

In addition to the data files described below, UDIS makes use of base maps, used extensively with overlays, which are updated every two years. It costs approximately \$300,000 to conduct these aerial surveys. In 1970 their base maps and data files had many inaccuracies but these have now been corrected and changes are entered as they occur. Nevertheless they feel they must continue to conduct these biennial surveys.

4, 5, 2,
6, 7, 8

virginia (continued)

The Planning Dept. has shown a slight interest in using LANDSAT imagery for updating. Mary Goodwin of the Stream Valley Board - the scientific advisory board to the Board of Supervisors has been using U-2 imagery for mapping watersheds and has tried without success to get the Board of Supervisors to listen to a presentation by Albert Rango, NASA/Goddard, on the use of LANDSAT in flood plain mapping. The Stream Valley Board plays an active role in the planning process but allocation of funds is made by the Board of Supervisors. Ms. Goodwin is seeking ways to influence the board to fund more work in this area.

The heart of UDIS consists of six parimary data files consisting of: (1) The Parcel File - a complete, current inventory of land parcels, including geographic identifiers, zoning, land use, physical and structural characteristics, and financial descriptors. The Parcel File provides the basic inventory data to monitor existing conditions. (2) The Sanitary Sewer Network - an inventory of all components in the sanitary sewer network. (3) The Rezoning Case File - Each petition for a zoning reclassification constitutes a separate record on the Rezoning Case File. The file contains pertinent data such as acreage, existing and proposed zoning classification and allowable densities, likely density yields, the expected date of rezoning, and an estimate of the resulting construction schedule. (4) The Building Permit File - with descriptive data from the permit application. (5) The Residential Builder Plans File - This file contains a separate status report for each active subdivision or apartment project in Fairfax County. (6) The Non-Residential Builder Plans File - similar to above for non-residential projects.

Virginia (continued)

Selected information in these files is regularly organized in formats and reports meaningful to decision makers, and to the public at large.

The major codes available for sorting, aggregating and re-ordering by computer are as follows:

1. Land Use Code - a three character numerical code to describe the predominant land uses on parcels of land.
2. Planned Land Use Codes - A two character numerical code arranged in a seven-space format.
3. Zoning Codes - A three character numerical code.
4. Subdivision Codes - Four digit numerical codes identify individual subdivisions.
5. Builder Codes - Four digit numerical codes identify developers and show who is developing what in Fairfax County.
6. Geographic District Codes - The county is divided and coded in the following types of districts: Voting District, Planning District, Sewersheds, Census Tracts, Subcensus Tracts, School Districts, and combinations of the above.

Many other coding mechanisms are used by UDIS and others are in the process of development. For instance nine checkpoints identify the stage of completion of a project in the development process. They signify "confidence levels" in the Builders Plans File and are important in laying out legal and policy positions for decision makers.

UDIS is a conceptual framework rather than a "system" in the classical sense. It was developed with transferability as a major goal but it cannot be done by a simple exchange of file formats and computer programs.

Virginia (continued)

The direct costs for staff salaries, administrative expense and publishing and consulting fees to create the UDIS system totaled \$351,000. Office space, time contributed by County staff, and other county support including new base maps totaled \$384,000. The UDIS professional staff estimated that it could be transferred to another jurisdiction comparable in size, (600,000 people and 150,000 parcels with a growth rate of 10,000 housing units per year), for an estimated \$275,000 in direct costs. More precise figures are available from the UDIS staff.

The hardware configuration in Fairfax County consisted originally of an IBM 360 Model 40 with 256 K and an IBM 360 Model 50 with 512 K, both with associated peripheral equipment. Later an IBM 370 Model 155 was acquired. However the Fairfax staff says that a 64 K computer would be adequate for establishing a UDIS system. The County's computers are used for many other purposes. The drafting department has also acquired a Wang 2200 System plotter and graphic display.

UDIS utilizes the following software packages obtained from the indicated sources:

Easytrieve -	Pansophic Systems, Inc.
Generalized Information Retrieval System -	ECCO Consulting, Inc.
Computer Graphics System -	ECCO Consulting, Inc.

Some County departments and officials were reluctant to make full use of UDIS as an operational tool over the older established ways. This is no longer true. The biggest factor in converting nay-sayers into enthusiastic users probably was its use by the County Attorney's Staff.

Virginia (continued)

UDIS reports gained considerable attention and validity in the judicial processes and helped strengthen the positions of those who made use of them.

Although the various County departments and elected officials made extensive use of UDIS produced reports and computer graphics, there is little direct interfacing between man and machine.

The County has invested heavily in computer equipment which could be used for such things as image analysis but has no such plans in mind at present. Ms. Goodwin is trying to demonstrate the feasibility and effectiveness of such an approach.

William B. Rucker has probably the most detailed knowledge of the UDIS program amongst the contacts listed.

The other contacts listed were involved in the early development of UDIS and are interested in its transferability to other jurisdictions.

CONTACTS:

1. Walter J. Monasch, Director, Office of Comprehensive Planning, County of Fairfax, 10555 Main Street, Fairfax, VA 22030, (703) 691-2641.
2. Mary Goodwin, Stream Valley Board, 10555 Main Street, Fairfax, VA 22030, (703) 691-3377.
3. Edward Gurski, Commissioner, Planning Commission, 7417 Exmore Street, Springfield, VA 22150.
4. Samuel A. Finz, Director, Office of Research and Statistics, Massy Bldg., Fairfax, VA 22030.
5. William B. Rucker, Coordinator of Special Projects and Growth Management, Office of Research and Statistics, (703) 691-3341.

Virginia (continued)

6. James E. Hoben, Assistant Director, Urban Planning Research and Development, Dept. of Housing and Urban Development, (202) 755-6970.
7. Dr. Murry Seldin, Director of the Urban Development Studies Program, American University, (202) 696-2000.
8. John C. Lay, Director of Mapping, Massy Bldg., Fairfax, VA 22030, (703) 691-2711.

WASHINGTON

Summary of State Role

Local projects in remote sensing for Washington are less significant than the three-State effort being conducted for Washington, Oregon and Idaho by the Pacific-Northwest Regional Commission. This project, a demonstration to apply the output of LANDSAT to the concerns of State governments, is being conducted by several task forces. The task forces are subject-oriented; e.g., the Natural Resources Task Force, the Urban Problems Task Force, etc. It is expected that upon completion of the three year project the necessary information for implementing an operational LANDSAT based Land Resource Inventory system will have been provided. Financial support for operational systems would then be normally generated within the region served.

The Washington State Department of Natural Resources currently utilizes a land use inventory of State Lands, about three million acres (about 14% of the State). This Gridded Resource Inventory Data System (GRIDS) is based on a grid of 10 surveyor's chains (660 feet). Each grid square is characterized by a single central point where the land use is identified. Thus, a land inventory mesh describing the use of each 10 acres of land is stored. Data were obtained from the results of an aerial survey program, which is routinely updated by reflying. GRIDS is operational on an IBM 360/30, with maps generated by line printout.

The Government Land Office Survey has generated a state grid based on township surveys. (Townships consist of 36 sections of one square mile.) One computer output sheet will contain a single township and is useful in land management decisions.

The four counties around Seattle have a geographic polygon computerized land use system which is currently in financial difficulty. The State Legislature has, for the past several years, considered passing land use legislation, without significant progress.

CONTACTS:

1. Roger Harding, Dept. of Natural Resources, State of Washington, Olympia, Washington, (206) 753-5338.
2. Harlan Dulmage, Manager of Data Processing, Seattle, Washington, (206) 447-3193.
3. Michael McCormack, Office of Community Development, State of Washington, Olympia, Washington, (206) 753-2425.

WEST VIRGINIA

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Summary of State Role

At present, West Virginia has no integrated land use information system. However, there is presently a good bit of activity towards that end. Under the Governor's Office of Federal State Relations, an interagency task force has been set up to examine the requirements for such a system. Also the state has contracted with USGS to prepare a statewide computerized land use map at 1:250,000 and certain SMSAs at 1:24,000. As a member of the Appalachian Regional Commission, the state is enthusiastically participating in the development of the Eastern States Strip Mine ASVT. In addition the state DNR is participating in a LANDSAT II investigation.

CONTACTS:

1. Mike Lake, Coordinator for LANDSAT Programs, Dept. of Natural Resources, State Capitol, Charleston, West Virginia, (304) 348-2453.
2. Ed Long, Director, Land Use Development, Governor's Office of Federal State Relations, State Capitol, Charleston, West Virginia, (304) 348-8853.

WISCONSIN

Summary of State Role

The State Planning Office in the Dept. of Administration has been the lead agency in coordinating all remote sensing activities in Wisconsin. The Planning Office has worked closely with the University of Wisconsin - Madison on LANDSAT and other remote sensing and applicability studies. It is currently developing land use and natural resources and information management systems and other programs in cooperation with the University.

The Natural Resources Information System (NRIS), the geobased information system developed by Raytheon and used by the Bureau of Indian Affairs and Bureau of Land Management is now undergoing testing and refinement as a statewide retrieval system. Other systems are also being evaluated and the final result will probably be a highly modified NRIS type system. A statewide system will probably be fully operational in five years. (Earlier estimates were predicated upon funding from a National Land Use Act.)

A state-wide land use classification system has been established to provide a common language for the sharing of data, and a directory listing all available maps, aerial photography has been completed. (There has been considerable duplication in the acquisition of such data and there are over 10,000 entries in this Directory.)

Curtis Wilcott, at the University, feels that the NRIS programs are too inefficient and expensive for extensive data handling. They expect to use a good part of the NRIS programs but the final product will be a hybrid system using routines based upon their own work and their evaluation of approximately 30 other systems.

The operational system will have computers terminals widely dispersed throughout the State agencies and other concerned bodies and will have direct query mode capability. This will permit direct man-machine interfacing without the intermediation of programmers.

James Clapp, Director of the Environmental Monitoring and Planning Group is a strong advocate of a cadastral type system in which the land is linked not only to natural resources and environmental data but also to all other land-related data (ownership, tax records, etc.) of interest to the operating agencies.

Wisconsin (continued)

The University's IBM 370, which is used primarily for the University's business and non-research directed activities, is now being used by Wilcott's group as the NRIS programs were written for this type machine. They are converting programs for use on the University's Univac 1110. The University feels that there is a better than even chance that the University will be selected to operate the Data Processing Center of the State system and will use this computer when it goes operational.

The NRIS program was started with State funding with expectations of Federal funding with the passage of a National Land Use Act. Now the State has not been able to continue the program as originally planned. Funding is now coming through the College of Agriculture from the Dept. of Agriculture. Both the University and the State Planning Office are seeking additional State and Federal support for this program.

A Remote Sensing Data Center is also maintained by the Environmental Monitoring and Data Acquisition Group of the Institute for Environmental Studies at the University. Low altitude black and white, color, and color infrared photography, thermal imagery, high altitude RB-57 imagery, LANDSAT-1 70 mm and 9" transparencies and a 16 mm browse file of LANDSAT imagery is available. Publications to support the imagery are also available. Announcements of new acquisitions are mailed to potential users and catalogs are distributed. There is considerable cross-referencing in the card catalogs to assist lay persons in finding products related to the problems studied.

The Land Resources Analysis Program (Land RAP) provides interim information on the distribution of land resources and their inherent limitations and capabilities to support alternative activities. The State Planning Office is coordinating this program which draws primarily upon resource data already available in State government in diverse forms difficult to use. Experts in various State agencies, particularly the Wisconsin Geological and Natural History Survey, compile and analyze this data and make it available to decision makers. Maps are also being produced and the program is being used to demonstrate the possible needs and utility of improved information and analysis tools. A LANDSAT derived, land cover map of Wisconsin was included in Land RAP.

The trophic status of all lakes in Wisconsin over 20 acres in extent have been computer classified by the University with both financial and investigative support (Ground Truth) from the Dept. of Natural Resources. LANDSAT computer compatible tape and interactive terminals were used in this mapping.

Wisconsin (continued)

effort and excellent correlation with ground truth was achieved. Data, techniques, and programs derived from this study will, hopefully, be included in the state information system. Currently the DNR is preparing to use its own interactive terminal for analysis of satellite data by its own technicians for monitoring lake eutrophic levels.

The Critical Resources Information Program (CRIP) is another program supported by the State Planning Office. The Department of Administration and the Upper Great Lakes Regional Commission funded the original study which was carried out in five inland Wisconsin counties. The study concentrated on the development of critical resource assessment techniques and a system which was to be available to all agencies, groups and individuals affected by environmental matters. There was some planning for a computerized information system but it now appears that the State's developing hybrid NRIS will be used. The Environmental Monitoring and Data Acquisition Group concentrated on the acquisition of data and development of methodologies. The program has now been transferred to the University Extension Service which is better staffed to work on routine matters on a statewide basis. The program has been extended to coastal counties where the State Departments of Administration and of Natural Resources and the three regional planning commissions which border on the Great Lakes -- the Southeastern Wisconsin Regional Planning Commission, the Bay Lake Regional Planning Commission and the Northeastern Wisconsin Regional Planning and Development Commission are providing the institutional foundation for the development of a coastal zone management process which will be integrated into the existing and planned state and regional comprehensive land use and environmental planning.

The so-called "Hatch Project" being conducted by the College of Agriculture of the University is also of interest. The McIdas (Man-computer Interface Data Accessibility System) is a weather information data bank based on the use of a small minicomputer which can access the large University Univac 1110. Although intended principally for the use of meteorologists, it is being used by LANDSAT and other investigators. There may be greater interaction between the McIdas group, LANDSAT investigators and the State planners as the State natural resources information system develops.

A number of localities are using geobased information systems which are not connected to the State's efforts. These are concerned primarily with such functions as school districting, busing, land transfers and assessments, police and fire department operations, all on a relatively small scale. Perhaps the most sophisticated is that of the Southeastern Wisconsin Regional Planning Commission described in the following pages.

Wisconsin (continued)

The Southeastern Wisconsin Planning Commission's Geographic Information System

The SWPC is by far the oldest and probably strongest regional planning council in Wisconsin. It includes seven counties and includes the city of Milwaukee. It has an IBM 370/135 computer, a Calcomp plotter and digitizer and terminal connections to other agencies. Its geobased information system is based on the Bureau of Census' DIME program. It covers 2,689 square miles divided into 680,000 cells 100 meters square. All 10,800 U.S. Public Land one quarter sections (the basic unit of analysis for local data compilations) have been digitized by their corners and these are further broken down into 16 subsections. In addition the boundaries of such units of analysis as watersheds, and school districts have been digitized and they have the capability of digitizing the boundaries of any other unique area. It budgets approximately \$250,000/year for equipment and maintenance and another \$250,000/year for salaries.

The Commission has prepared and is maintaining a series of base maps to National Map Accuracy Standards. (Last full aerial coverage 1970.) at a scale of 1:400 and 1:2000.

The Commission's information system is used in a wide range of planning activities such as highway network analysis, natural resources data analysis and projection, flood and watershed studies, and hydrologic inventories.

The Commission has used LANDSAT derived data but has not made direct use of such data itself.

CONTACTS:

1. Stephen M. Born, Director (Bureau of Planning and Budget, Dept. of Administration) State Planning Office, B-130, 1 West Wilson Street, Madison, Wisc 53702, (608) 266-3382.
2. Allen H. Miller, Land Use Coordinator, State Planning Office, B-130 1 West Wilson Street, Madison, Wisconsin 53702, (608) 266-3382.
3. Thomas M. Krauskopf, Planning Analyst, State Planning Office, B-130, 1 West Wilson Street, Madison, Wisconsin 53702, (608) 266-3382.
4. Dade Marshall, Planning Coordinator, State Planning Office, B-130, 1 West Wilson Street, Madison, Wisconsin 53702, (608) 266-3382.

Wisconsin (continued)

5. Max E. Ellis, Assistant Director (Social Science Data and Computation Center and Manager of Contract Programming), Madison Academic Computing Center, Univ. of Wisconsin-Madison, Madison, Wisconsin 53706, (608) 262-7962.
6. F. H. Schraufnagle, Director, Bureau of Standards and Surveys, Dept. of Natural Resources, Madison, Wisconsin 53702, (608) 266-3291.
7. James L. Clapp, Director, Environmental Monitoring and Data Acquisition Group, Dept. of Geography, Univ. of Wisconsin, Madison, Wisconsin 53702, (608) 262-1978.
8. Curtis Wilcott, Dept. of Landscape Architecture, University of Wisconsin, Madison, Wisconsin 53702, (608) 262-2677.
9. James W. Jondrow, Program Monitor, EMDAB, Institute for Environmental Studies, Univ. of Wisconsin, Madison, Wisconsin 53702, (608) 262-9585 and 263-4788.
10. K. W. Bauer, Southeastern Wisconsin Regional Planning Commission, 916 North East Avenue, Waukesha, Wisconsin 53186, (414) 547-6721.
11. John A. Boylan, Southeastern Wisconsin Regional Planning Commission, 916 North East Avenue, Waukesha, Wisconsin 53186, (414) 547-6721.

WYOMING

Summary of State Role

Wyoming passed a state land use act in the spring of 1975 with three goals:

- A. To establish a land use "hot line."
- B. To establish a "Natural Resources Information System."
- C. To provide \$10,000/year for two years to each of Wyoming's 23 counties as local planning grants.

Dr. James Ahl, Executive Director, Office of Land Use, is now developing plans to implement the state land use act. There are nine commission members and 27 advisory committee members and he expects to have definitive plans by early 1976. Dr. Ahl was formerly with the State of Michigan and was first a program director for MSU for their program with ERIM. He therefore is very familiar with remote sensing in general and LANDSAT in particular.

University of Wyoming

Dr. Robert Houston and Mr. Ronald Mars are performing land use mapping in Wyoming, with particular emphasis on the Powder River Basin, in cooperation with the USGS and the state geological survey. They are making full use of NASA information, including LANDSAT, SKYLAB and aircraft data. They have completed two counties in the Powder River Basin.

CONTACTS:

1. Dr. James Ahl, Executive Director, Office of Land Use, 1720 Carey Avenue, Suite 500, Cheyenne, (307) 777-7493.
2. Dr. Robert S. Houston, University of Wyoming, Laramie, (307) 766-1121.

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Attachment III

AMBIONICS, INCORPORATED

400 Woodward Building

Washington, D.C. 20005

(202) 638-6469

SURVEY AND ANALYSIS
OF POTENTIAL USERS
OF REMOTE SENSING DATA

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INTRODUCTION

This report was prepared to assist in the links between NASA and the current and potential users of remote sensing in the 50 States. Under an earlier contract (NASW-2555) Ambionics wrote the "Users Reference Manual", which examined remote sensing applications for the activities of the regional inter-state organizations, the federal agencies, and the private sector. Twelve States were covered in some depth in the Users Reference Manual.

The survey presented here is similar in nature to the earlier study, but covers activities in all 50 States. Emphasis has been placed on on-going operational programs and no attempt was made to cover the activities of the federal agencies except insofar as they impinged on State or other regional or metropolitan programs.

Ambionics was given the additional task of reporting on state and significant land use and/or natural resources inventory and monitoring information systems late in the program; thus there is a distinct separation in our presentation between information systems from other remote sensing programs.

APPROACH TO THE SURVEY

As in our previous reports, we have emphasized people and the roles they play. Remote sensing by the use of satellite imagery is now recognized as a highly effective tool by many in the State governments. The major problem - as usual - is funding.

The recession obviously has had a strong impact and this coupled with the lack of strong federal land use legislation (and accompanying moneys on which many of the states had counted has caused many shifts in State planning. However, there are now individuals in many of the State Governments and regional bodies who are convinced of the effectiveness and usefulness of remote sensing. Many of these individuals are identified in this report. The programmatic shifts and changes often reflect their efforts to obtain funding to implement these new technologies.

In the Users Reference Manual, we wrote that This manual is full of "success stories" showing the value of the program and if these successes are followed up the applications benefits are staggering. Yet, nowhere did we find overwhelming commitment to the program....

When questioned as to this lack of commitment the responses

of spokesmen for these organizations reflected fell into six categories: (1) lack of knowledge of the ERTS program, (2) disbelief in the applicability of ERTS products to their areas of concern, (3) lack of funds, (4) need for a demonstration of truly large benefits, (5) need for a near real-time data processing distribution system to meet their operational demands, (6) and the lack of a guarantee that the ERTS data will continue to flow.

Lack of funds, quoted in the above list, was a universal complaint. It is now, and in all likelihood always will be. However, spokesmen who earlier stressed lack of funds as the justification for lack of action now tend to see this problem in terms of continued funding for programs well underway. Often, they speak of seeking funds from sources they have specifically identified with an interest in keeping their programs going. These programs are actively competing for funds; lethargy on the State level is not as prevalent as it was earlier.

The response, "lack of knowledge", is also of diminishing significance for the State level. The areas where understanding grows dim are no longer in what's available, but now are in what's best. There is a real difficulty in choosing

among various approaches and machinery for implementing a given program. Many respondents voice interest in guidelines in this area. In many cases, there is a tendency to reserve decision and to save funds until other less cautious investigators have shown the way.

At the local and urban regional level, lack of knowledge is appalling. Most planners are not entirely familiar with State-level activities in this area, even for their own States. The more knowledgeable are aware of Landini's work in the Los Angeles Planning Department and the USGS Census City project conducted by James Wray.

It must be added that most of Ambionic's information on metropolitan systems came from planners and information specialists to whom a map is a map. They start with what is available. If one of sufficient accuracy and detail is not available, they have a new one prepared using current technology. More on this later.

The response, "disbelief in the applicability of ERTS (LANDSAT) products to their areas of concern," is still evident on the part of some individuals but supportive views now appear to far outnumber the negative views.

The response, "need for a demonstration of truly large benefits" is voiced as frequently as in the past but in a different context. It used to be: "show me". Now it is "help me show others". This, of course, is at the state and inter-state or regional level. Most local planners are just not ready for cost-effectiveness studies, so that showing of the benefits is not easy.

"Need for a real-time data processing distribution system" was seldom heard this time around. This should not be taken to mean lessened importance. We take this to mean that those most actively involved in developing operational systems have come to accept - for the time being - the current delivery system. Those who manage resources day to day and need near real-time data are not considering LANDSAT as applicable to their needs in this respect.

Our last category, "lack of a guarantee that ERTS (LANDSAT) data will continue to flow" was considered to be of the greatest significance in our earlier study. This no longer appears true. There seems to be general acceptance that LANDSAT-type data (with even greater resolution) will be forthcoming.

DISCUSSION OF SURVEY RESULTS

The detailed results of the survey are contained in Attachments 1 and 2. Here, it is worthwhile to present some general observations and highlights of the program.

In this study we have concentrated on the operating agencies. However in many of the states the state universities work very closely with the state agencies (Wisconsin and Indiana are examples). In these cases, we have described the role of the universities in this work.

The cities and counties have developed a variety of geoprocessing procedures. But few city or county planners have really given serious thought to the possible impact of LANDSAT-type imagery on their operations. Some have used LANDSAT derived products (maps and study reports) prepared by others but they have not seriously considered such data routinely.

The Massachusetts Land Records Commission has been working to develop and obtain legislative support for an integrated land and resources information system in Massachusetts.

McDonald Barr, the Executive Director of the Commission, also has been seeking support for a regional information system.

On November 7, 1975, the six New England governors considered a proposal presented by Barr that they appoint a steering committee to draft a program for demonstrating an integrated land and resources information system. Due to the pressure of time (Governors were to meet with President Ford in another meeting.), need for more specific information on costs, and opposition from New Hampshire, the matter was deferred to another meeting which should take place within a few months.

At the two day "Space Applications to Northeastern Regional Problems" symposium sponsored by NASA and the University of Connecticut/Storrs, November 18 and 19, 1975, Barr will attempt at another level to organize a New England group to sponsor a regional geobased information system. Remote sensing will play only a small part in such a program but it will be a critical role.

CONCLUSIONS

Most mapping applications can be made after it is determined that there is a need and that sufficient data have been collected to warrant a mapping effort. The states have concentrated on this area where little money need be risked. More maps and mosaics will be produced - and will be used effectively by operating agencies in many fields just as they have always used maps when available - but the full usefulness of LANDSAT-type data will not be demonstrated until an operational, multipurpose system with monitoring capabilities goes on-line.

We now believe that the application of LANDSAT-type imagery in land use planning and data information systems on a massive scale will come about through the efforts of the federal and state agencies, or through a regional approach. This is true even in those states where the local governments are charged with the responsibility of recommending or implementing statewide policies. For example, in New England the implementation of land use legislation has been primarily a local matter. The overall costs of monitoring, regulating and planning has been increasing dramatically in this region.

Duplication of effort has been extensive and many have been calling for consolidation of effort.

Two years ago when we spoke to state officials there were almost universal indications that they considered satellite remote sensing as new exotic methodology looking for a justification for its existence. There were sharp complaints that the NASA and other remote sensing "experts" didn't understand and didn't care about their problems and weren't responding to their needs. The complaints still come but with far less heat and conviction. Usually the complaint is really based upon the feeling that there is inadequate federal funding and coordinated support by the federal agencies.

The local governments positions now vis-a-vis NASA and remote sensing is similar to the states position a few years ago. More important: they frequently appear to view the activities of the state people in the same fashion. The Ambionics staff does not feel that the cities and other localities are going to become major direct users of satellite imagery in the near future but within their organizations are some of the most important decision makers who will be making use of these products. Communication between the federal, state and local agencies is important and is being largely ignored today.

In our study we have largely ignored the great amount of informal work and activities that have been carried out by many state and local government agencies and individuals acting on their own in cooperation with the various NASA centers and individuals within the center.

We believe that these informal contacts are probably as important, or more important than many of the more formal programs we have described.

Changes in applied technology are brought about by people. Whatever happens to the programs described in our report, the people we have reported on will continue to play major roles in introducing these innovations.

We hope that our efforts will be reflected in better communication between these innovators.